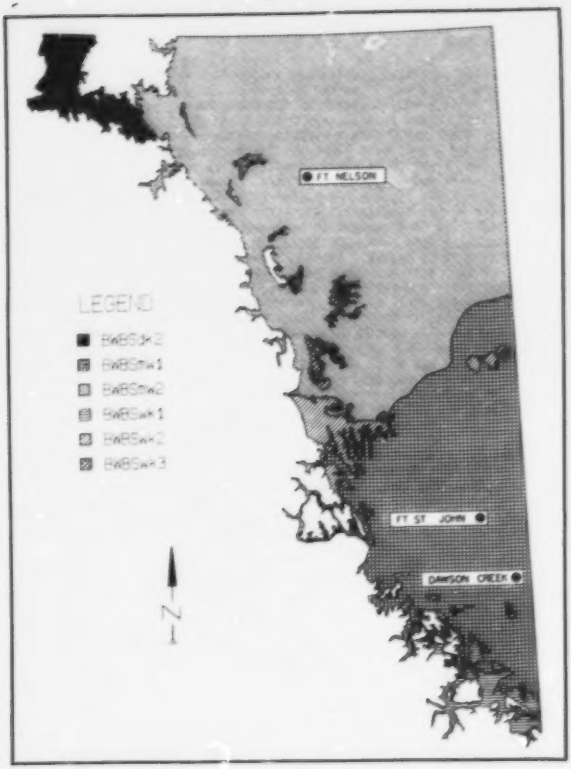

FIGURE 1. Biogeoclimatic units of the northeast portion of the Prince George Forest Region.

TABLE 1. New names for biogeoclimatic and site units in the northeast portion of the Prince George Forest Region

Old variants and ecosystem associations	New variants and site series
BWBSc1	**BWBSmw1**
01 Highbush-cranberry - Trailing Raspberry	01 SwAt - Step moss
02 Pine - Kinnikinnick	02 Pl - Lingonberry - Velvet-leaved blueberry
03 Pine - Soopolallie	03 Sw - Wildrye - Peavine
04 Pine - Black Spruce	04 Sb - Lingonberry - Coltsfoot
05 Highbush-cranberry - Oak Fern	05 Sw - Currant - Oak fern
06 Highbush-cranberry - Tall Bluebells	06 Sw - Currant - Bluebells
07 Spruce - Horsetail	07 Sw - Currant - Horsetail
08 Black Spruce - Horsetail	08 Sb - Labrador tea - Sphagnum
BWBSc2	**BWBSmw1**
01 Highbush-cranberry - Trailing Raspberry	01 SwAt - Step moss
02 Soopolallie - Fuzzy-spiked Wildrye	02 Pl - Lingonberry - Velvet-leaved blueberry
03 Prickly Rose - Fuzzy-spiked Wildrye	03 Sw - Wildrye - Peavine
04 Pine - Black Spruce	04 Sb - Lingonberry - Coltsfoot
05 Highbush-cranberry - Bluejoint	06 Sw - Currant - Bluebells
06 Spruce - Horsetail	07 Sw - Currant - Horsetail
07 Black Spruce - Horsetail	08 Sb - Labrador tea - Sphagnum
BWBSa1	**BWBSmw2**
01 Aspen - White Spruce	01 SwAt - Step moss
	02-$ At-Sw - Step moss[a]
02 Pine - Lichen	02 Pl - Lingonberry - Velvet-leaved blueberry
03 Pine - Black Spruce	03 Sb - Lingonberry - Knight's plume
04 Pine - Clubmoss	04 Sb - Lingonberry - Coltsfoot
05 Spruce - Horsetail[b]	05 Sw - Currant - Horsetail
05//Ml Balsam Poplar - Horsetail	05-$ Ac - Alder - Horsetail
06 Black Spruce - Horsetail	06 Sb - Feathermoss - Bluebells
07 Tamarack - Horsetail	07 Lt - Horsetail
08 Black Spruce - Sphagnum	08 Sb - Cloudberry - Sphagnum
09 Black Spruce - Willow	09 Sb - Willow
10 Tamarack - Buckbean	10 Lt - Buckbean

A Field Guide for Identification and Interpretation of Ecosystems of the Northeast Portion of the Prince George Forest Region

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1 INTRODUCTION

This guide describes the lowland and montane ecosystems (below 1200 m in the south and 1050 m in the north) in British Columbia's northeastern corner (Figure 1). This area, northeast of the Rocky Mountains, encompasses the Alberta Plateau, Liard Plateau, and Liard Plain physiographic regions (Holland 1976). It is characterized by a northern continental climate, with very long, cold winters and short, warm summers. The landscape is a mosaic of poorly drained muskeg, mixed seral stands containing lodgepole pine and aspen, and some mature white and black spruce stands. Fires are common and the Northern Fire Ecology Project reports (Parminter 1983, 1984)[1] describe the fires' impact on the boreal landscape. The guide presents aids to the identification of described units, and management interpretations for each.

The units in this guide are described in the biogeoclimatic ecosystem classification (BEC) system. It is assumed that the user has a working knowledge of this system. Those unfamiliar with the system should consult Pojar (1983) for a non-technical account, or contact the Ecology personnel in the Forest Sciences Section, B.C. Ministry of Forests, Prince George. Most of the units described in this guide have also been described in other publications and reports: Meidinger and Lewis (1983)[2] for the Fort Nelson Timber Supply Area; Jang et al. (1986)[3] for the BWBSmw1 (previously BWBSc1); DeLong (1988) for the seral units of the BWBSmw1; Annas (1977) for the BWBSmw2 (previously BWBSa1); and Jang et al. (1987)[4] for the BWBSwk1 (previously BWBSd1). As well, soil surveys have been done in the Peace River (Farstad et al. 1965) and Fort Nelson (Valentine 1971) areas, and the land base near

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1 Parminter, J. 1983. Fire-ecological relationships for the biogeoclimatic zones of the Fort Nelson Timber Supply Area. Northern Fire Ecology Project. B.C. Min. For., Victoria, B.C. Unpublished report. 53 p. and: 1984. Fire-ecological relationships for the biogeoclimatic zones of the northern portion of the Mackenzie Timber Supply Area. Northern Fire Ecology Project. B.C. Min. For., Victoria, B.C. Unpublished report. 102 p.

2 Meidinger, D., T. Lewis and R. Kowall. 1986. Biogeoclimatic zones and subzones of the northern portion of the Mackenzie Timber Supply Area. North. Fire Ecology Project. B.C. Min. For., Victoria, B.C. Unpublished report. 59 p.

3 Jang, L., A. McLeod, and D. Williams. 1986. A field guide for the identification and interpretation of ecosystems of the BWBSc1 in the Prince George Forest Region. B.C. Min. For., Prince George, B.C. Unpublished report. 39 p.

4 Jang, L., A. McLeod, and D. Williams. 1987. A field guide for the identification and interpretation of ecosystems of the BWBSd1 in the Prince George Forest Region. B.C. Min. For., Prince George, B.C. Unpublished report. 43 p.

TABLE 1. (Continued)

Old variants and ecosystem associations	New variants and site series
BWBSd1	**BWBSwk1**
01 Pine - Huckleberry	01 Sw - Huckleberry - Step moss
02 Pine - Lichen	02 Pl - Lingonberry - Velvet-leaved blueberry
03.1 Pine - Black Spruce - Velvet-leaved b.	03 Sb - Lingonberry - Coltsfoot
03.2 Pine - Black Spruce - Clubmoss	03 Sb - Lingonberry - Coltsfoot
03.3 Pine - Black Spruce - Black Twinberry	03 Sb - Lingonberry - Coltsfoot
04 Pine - Soopolallie	04 Sw - Wildrye - Peavine
05 Spruce - Highbush-cranberry	05 Sw - Currant - Bluebells
06 Spruce - Horsetail	06 Sw - Currant - Horsetail
07.2 Black Spruce - Horsetail - Sphagnum	07 Sb - Horsetail - Sphagnum
07.1 Black Spruce - Horsetail - Feathermoss	08 Sb - Willow - Glow moss
BWBSd2	**BWBSwk2**
01 Black Huckleberry - Bunchberry	01 Sw - Huckleberry - Step moss
02 Pine - Lichen	02 Pl - Lingonberry - Feathermoss
03 Soopolallie - Fuzzy-spiked Wildrye	03 Sw - Wildrye - Peavine
04 Labrador Tea - Lingonberry	04 Sb - Lingonberry - Coltsfoot
05 Black Gooseberry - Common Mitrewort	05 Sw - Currant - Bluebells
06 Spruce - Horsetail	06 Sw - Currant - Horsetail

[a]The "$" symbol indicates that the unit described is seral.

TABLE 2. Full correlated vegetation unit names for site series described in this guide

Site series	Vegetation unit names
BWBSmw1	
01	Sw - Populus - Hylocomium; Lathyrus
02	Pl - Vaccinium (vitis-idaea) - Vaccinium (myrtilloides)
03	Sw - Elymus - Lathyrus
04	Sb - Vaccinium (vitis-idaea) - Ptilium; Petasites
05	Sw - Ribes (triste) - Gymnocarpium
06	Sw - Ribes (triste) - Mertensia
07	Sw - Ribes (triste) - Equisetum (arvense and pratense)
08	Sb - Equisetum - Sphagnum
BWBSmw2	
01	Sw - Populus - Hylocomium; Vaccinium (vitis-idaea)
02	Pl - Vaccinium (vitis-idaea) - Vaccinium (myrtilloides)
03	Sb - Vaccinium (vitis-idaea) - Ptilium; Pleurozium
04	Sb - Vaccinium (vitis-idaea) - Ptilium; Petasites
05	Sw - Ribes (triste) - Equisetum (arvense and pratense)
05-$[a]	not correlated
06	Sb - Pleurozium; Mertensia
07	not correlated
08	Sb - Rubus (chamaemorus) - Sphagnum
09	not correlated
10	not correlated
BWBSwk1	
01	Sw - Vaccinum (membranaceum) - Hylocomium; Spiraea
02	Pl - Vaccinium (vitis-idaea) - Vaccinium (myrtilloides)
03	Sb - Vaccinium (vitis-idaea) - Ptilium; Petasites
04	Sw - Elymus - Lathyrus
05	Sw - Ribes (triste) - Mertensia
06	Sw - Ribes (triste) - Equisetum (arvense and pratense)
07	Sb - Salix (myrtillifolia) - Aulacomnium
08	Sb - Equisetum - Sphagnum
BWBSwk2	
01	Sw - Vaccinum (membranaceum) - Hylocomium; Ptilium
02	Pl - Vaccinium (vitis-idaea) - Pleurozium
03	Sw - Elymus - Lathyrus
04	Sb - Vaccinium (vitis-idaea) - Ptilium; Petasites
05	Sw - Ribes (triste) - Mertensia
06	Sw - Ribes (triste) - Equisetum (arvense and pratense)

[a]The "$" symbol indicates that the unit described is seral.

Tumbler Ridge has been ecologically described as part of an impact study for Northeast Coal development (Void 1977; Harcombe 1978). Wildlife values in the area are described in Fenger et al. (1989).

The units described in this guide have been renamed as part of the provincial correlation of the ecological classification system. The old names, and the corresponding units described in this guide, are listed in Table 1. Additionally, the complete correlated vegetation unit names for most of the site units are given in Table 2. The new biogeoclimatic unit codes and names are designed to be connotative -- that is, they describe the climate of the unit, relative to other subzones in the zone. The connotative symbols in this guide describe the relative moisture (x = very dry, d = dry, m = moist, w = wet, v = very wet) and relative temperature (v = very cold, c = cold, k = "kool", m = mild, w = warm, h = hot) for each subzone/variant within its zone. For example, the Moist Warm (mw) Boreal White and Black Spruce biogeoclimatic unit is coded BWBSmw; the Wet Cool ("Kool") unit is coded BWBSwk.

The site units have also been correlated and renamed. The number of units has been reduced, and similar units in different variants have been given the same name. For example, previously named ecosystem associations "Highbush-cranberry - Tall Bluebells" (BWBSc1/06), "Highbush-cranberry - Bluejoint" (BWBSc2/05), "Spruce - Highbush-cranberry" (BWBSd1/05), and "Black Gooseberry - Common Mitrewort" (BWBSd2/05) are all now within the "Sw - Currant - Bluebells" site association. They share this name because they are site series which are recognized as having similar "quality" (actual available moisture and nutrients) and vegetation potential. They also respond in a similar fashion to management practices.

2 USE OF THE GUIDE

The guide is divided into nine sections: the Introduction is Section 1; Section 2 describes the use of the guide; Section 3 describes the biogeoclimatic units (variants) included in the guide, and differentiates them; Sections 4-7 describe the site units within each variant, and their management interpretations; and Section 8 is Literature Cited.

2.1 Identifying Biogeoclimatic Units

Biogeoclimatic units are most easily identified from maps. Figure 1 provides an overview of the distribution of these units within the area covered by this guide. Biogeoclimatic unit maps at a scale of 1:250 000 are available from Ministry of Forests (MOF) District Offices, or the Forest Science Section, MOF, Prince George.

If an area lies near a mapped biogeoclimatic unit boundary and it is not clear which biogeoclimatic unit it belongs to, the user should compare the site units found in the area to those described for both biogeoclimatic units, and select the unit that best fits.

2.2 Identifying Site Units

Site units can be identified by a combination of soil, site and vegetation factors, which together are used to derive soil moisture and nutrient regimes for the site. Having selected the appropriate biogeoclimatic unit (Section 2.1), the user should inspect the area under consideration to determine if there are obvious moisture or nutrient differences which have led to the development of several vegetation units on the site. If several site units appear to be present, the user should stratify the area before identifying these units. At each site unit, the user should then record site features (2.2.1) and vegetation features (2.2.2), and use these to determine moisture and nutrient regimes (2.2.3).

2.2.1 Soils and topographic features

The most important topographic characteristics to note are: slope position (Appendix 1), slope gradient, and aspect. The most important soil characteristics to note are: soil texture (procedures for determining soil texture are given in Appendix 2); coarse fragment %; humus form and depth (procedures for determining humus form are given in Appendix 3); soil drainage class; depth to water table; and rooting depth.

2.2.2 Vegetation features

The plant species on the site and their relative abundance should be noted. Vegetation as described in this guide is for mature ecosystems. Caution must be exercised in using vegetation to classify disturbed sites. Species occurring infrequently but sometimes with moderate cover are enclosed in square parentheses ([ ]). Plant guides such as "Some Common Plants of the Sub-Boreal Spruce Zone" (Pojar et al. 1982) or "Some Common Plants of the Skeena Region" (Coupé et al. 1982) are helpful and may be available from the Forest Science Section, MOF, Prince George.

2.2.3 Moisture and nutrient regimes

The information from soils, topography and vegetation is used to estimate the relative amounts of moisture and nutrients available for plant growth. The guide user must keep two important factors in mind:

1. Moisture and nutrient regimes are relative within a biogeoclimatic unit. For instance, a site that is average in moisture regime in the ESSFwk1 will be wetter than a site that is average in moisture regime in the ESSFmv1.

ii. All factors must be taken into account when soil moisture and nutrient regime are determined. One factor may compensate for another; for instance, a coarse-textured soil, which might be expected to be dry, might be wetter if it occurs at the base of a slope.

Moisture and nutrient regimes can be estimated using the keys in Appendices 4 and 5.

2.2.4 Identification of units

After gathering soils, topographic, and vegetation information, the user should now proceed to:

i. the edatopic grid (e.g., Figure 2) where the moisture and nutrient regime can be used to locate the site unit on the grid; and

ii. the key to site units, where dichotomous keys use the soils, topographic, and vegetation features to identify a site unit.

The edatopic grid and the key to site units will direct the user to a particular site unit, or units. Soils, topographic, and vegetation features on the site can then be compared with those summarized for the particular site unit(s) to ensure the proper site unit is identified. Soil and site features characteristic of a certain site unit, or particularly useful in distinguishing it from other site units, are marked with an asterisk (*).

2.3 Management Interpretations

Once the site unit has been identified, the management interpretations for that unit are available on the page adjacent to the site unit description. Interpretations are offered as guidelines to the preparation of management prescriptions; they detail the opportunities and constraints that a resource manager must consider when dealing with a particular ecosystem. Management interpretations will be revised as more information, different technologies and different management objectives dictate. The site preparation method generally considered to be the most appropriate for the site is marked with an asterisk (*). More information about mechanical site preparation is available in Coates and Haeussler (1987).

3 BIOGEOCLIMATIC UNITS

The dominant biogeoclimatic zone in the study area is the Boreal White and Black Spruce (BWBS) zone. The BWBS is bordered by the Sub-Boreal Spruce (SBS) zone to the west, the Engelmann Spruce - Subalpine Fir (ESSF) zone above 1200 m in the southern portions, and the Spruce - Willow - Birch (SWB) zone above 1050 m in the northern portions of the area.

3.1 Distinguishing Floristic Features of the BWBS and Neighbouring Zones

The boreal nature of the BWBS climate is reflected in the vegetation of the zone, which includes many of the common species of the boreal regions of Canada. True climax forests are largely unknown in the BWBS, as few (if any) areas have escaped fire for several hundred years. Hypothetical climax forests may be dominated by white spruce and/or black spruce, or perhaps subalpine fir (rare, probably because of repeated burnings and lack of seed).

Fire has had a major influence on the development of many plant communities. Seral (non-climax) stands of predominantly aspen or balsam poplar dominate the lower elevations, whereas seral lodgepole pine dominated stands are common at the higher elevations and on coarser-textured soils.

The SBS (to the west of the BWBS) is moister, warmer and less "continental" than the BWBS. Upland SBS forests often have a component of subalpine fir in them and seldom contain black spruce. The ESSF and SWB (above the BWBS) have subalpine climates which are colder and moister than the BWBS. Vegetationally, the ESSF and SWB generally lack black spruce, but have a large component of subalpine fir. White-flowered rhododendron, absent in the BWBS, is a common component of most ecosystems in the ESSF. In the SWB, the understory is typically scrub birch and willow, neither of which are common understory components of most stands in the BWBS.

3.2 Variants of the BWBS

Within the BWBS there is considerable climatic variation which corresponds primarily to differences in latitude and elevation within the zone.

The latitudinal shifts in vegetation in the zone are subtle whereas the altitudinal shifts are quite significant. The BWBS[5] zone in the area is divided into five distinct biogeoclimatic variants:

BWBSmw1: Peace Moist Warm BWBS (previously BWBSc1 and BWBSc2)
BWBSmw2: Fort Nelson Moist Warm BWBS (previously BWBSa1)
BWBSdk2: Liard Dry Cool BWBS (previously BWBSa2)
BWBSwk1: Murray Wet Cool BWBS (previously BWBSd1)
BWBSwk2: Graham Wet Cool BWBS (previously BWBSd2)
BWBSwk3: Kledo Wet Cool BWBS (previously BWBSb)

3.3 BWBSmw

The BWBSmw covers the rolling topography from the Red Willow River near where the Alberta border transects the Rocky Mountains up to the Yukon and Northwest Territories borders. Elevation ranges from 650 to 1050 m in the south and 350 to 1050 m in the north. The climate is warmer

---

[5] Any further reference to the BWBS will be to only the area included in this guide.

and intermediate in moisture when compared to the other BWBS subzones. The forests are generally dominated by white spruce or aspen.

3.3.1 Peace BWBSmw - BWBSmw1 (previously BWBSc1 and BWBSc2)

The BWBSmw1 variant covers the rolling plains which extend from near where the Rocky Mountains transect the Alberta border, north to near the Beatton River. Elevation ranges from 750 to 1050 m. This variant has a drier and cooler growing season than the BWBSmw2, but the winters are warmer and moister (see Table 3). The forests in this variant are dominated by aspen. Balsam poplar is common on the low lying, wetter sites. White spruce is present on moist to wetter sites where there has been limited fire history. Lodgepole pine is present as a seral species on drier and poorer sites. Black spruce forests, often with a minor component of tamarack, are common on organic soils.

The Peace River Lowland portion of this variant provides year-round habitat for mule deer, white-tailed deer, moose, black bear, and small herds of Rocky Mountain elk. Much of the original lowland habitat has been converted to agricultural crops and wildlife use the few remaining aspen stands and riverbreaks. Sharp-tailed grouse occur in the more open habitats and ruffed grouse occur in the aspen stands. Wood bison, grizzly bear and gray wolf have been extirpated from this area.

The upland portion, both south and north of the Peace River Lowland, provides habitat for moose, caribou, black bear, gray wolf and grizzly bear. The numerous wetlands support large populations of breeding waterfowl, such as mallard, northern pintail, Barrow's goldeneye and common snipe. A few trumpeter swan also nest in these wetlands.

3.3.2 Fort Nelson BWBSmw - BWBSmw2 (previously BWBSal)

The BWBSmw2 variant covers the undulating terrain and lowlands from near the Beatton River in the south, to the Northwest Territories and Yukon borders in the north. This variant is wetter and warmer during the growing season but colder during the winter compared to the BWBSmw1. Elevation ranges from 300 to 1050 m. Aspen - white spruce forests dominate the better drained sites. On the poorly drained sites black spruce forests, often with a minor component of tamarack are common. Tamarack can form almost pure stands on very wet sites. Lodgepole pine is relatively common, especially on wetter sites in combination with black spruce or well-drained higher elevation sites. Balsam poplar, white spruce and often trembling aspen and paper birch are common on the floodplains of the major water courses.

The extensive Fort Nelson Lowland provides habitat for wintering populations of caribou, black bear, and furbearers, especially lynx, marten, beaver and muskrat. Moose are more commonly found along the riparian areas. The numerous wetlands support large populations of waterfowl, such as mallard, northern pintail, blue-winged teal and northern shoveler, and shorebirds,

TABLE 3. Summary climate data for biogeoclimatic units[a]

BGC unit	Seasonal precipitation May-Sept (mm)		Annual precipitation (mm)		Annual mean temperature (°C)		Mean annual snowfall (cm)		Frost-free period (days)	
	Mean	Range	Mean	Range	Mean	Range	Mean	Range	Mean	Range
BWBSmw1	290	225-355	485	395-660	+1.1	-1.2-+2.7	190	130-250	150	125-170
BWBSmw2	295	275-345	460	450-485	-1.6	-2.2--1.1	185	N/A	105	N/A
BWBSdk2	225	195-255	460	440-480	-2.1	-2.9--0.6	195	190-205	75	55-85
BWBSwk1	320	230-395	645	630-660	+0.9	+0.2-+1.9	210	N/A	90	N/A
BWBSwk2	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
BWBSwk3	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A

[a] Reynolds, G. 1989. Climatic data summaries for the biogeoclimatic zones of British Columbia. B.C. Min. For., Research Branch. Victoria, B.C. Unpublished report.

such as yellowlegs, common snipe, semipalmated plover and Wilson's phalarope. The riparian habitats and southerly-facing aspen forests adjacent to the Rocky Mountain Foothills in the Muskwa River drainage provide year-round habitat for Rocky Mountain elk, moose, mule deer, white-tailed deer, grizzly bear and gray wolf, while the deeply dissected canyons of the Sikanni River provide escape terrain for mountain goat, Stone's sheep and mule deer.

3.4 BWBSdk

The BWBSdk in the Prince George Forest Region is found only in the Liard River drainage upriver of the Hells Gate rapids, between the elevations of 400 and 1100 m. It is located below the SWB and borders the BWBSmw2 near the Hells Gate rapids.

The general climate is drier and colder with a shorter growing season than the BWBSmw.

3.4.1 Liard BWBSdk - BWBSdk2 (previously BWBSa2)

The BWBSdk2 Variant is the only variant of this subzone found in the study area. It is relatively dry during the growing season, but wetter during the winter.

Mature forests on upland sites are dominated by white spruce, sometimes with variable amounts of subalpine fir and black spruce. Seral stands of lodgepole pine, trembling aspen, and mixes of white spruce, aspen and lodgepole pine are common, especially on upland sites. Wetland sites are dominated by black spruce with a minor component of tamarack. Because of the limited extent of this variant within the area described by this guide, no further discussion of this unit will be made in the text.

The Liard Plain provides habitat for moose, wintering caribou, gray wolf, black bear and furbearers, especially lynx, wolverine, marten, beaver and muskrat. A small population of Rocky Mountain elk is found on the north side of the Liard River, between Hells Gate rapids and Liard Hot Springs. The wetlands support breeding populations of waterfowl, especially mallard, northern pintail, common goldeneye and ring-necked duck.

3.5 BWBSwk

The BWBSwk is found in the foothills and on lower to mid-slopes of the Rocky Mountains from the Alberta border, northward to the Yukon border. The BWBSwk is widespread at its southern extent, whereas in the north it is reduced to isolated pockets. It is located between the BWBSmw and either the ESSF or SWB at elevations of 900-1300 m depending on the latitude and topography.

The general climate is wetter and cooler with a shorter growing season than the BWBSmw (see Table 3). The forests are generally dominated by white spruce or lodgepole pine.

3.5.1 Murray BWBSwk - BWBSwk1 (previously BWBSd1)

The BWBSwk1 variant is found in the foothills and mid to lower slopes of the Rocky Mountains from where the Rocky Mountains transect the Alberta border to just north of the Peace arm of Williston Lake in the Hackney Hills. Elevation generally ranges from 1050 to 1200 m but can occur as a narrow band from 900 to 1050 m in some of the portions that are in the Rocky Mountains. The climate during the growing season is slightly drier and colder with a shorter growing season than the BWBSwk2. The winters are warmer with a higher snowpack than the BWBSwk2 (Table 3).

Mature spruce forests are dominated by white spruce, with minor amounts of black spruce occurring on wetter and poorer sites. Pure black spruce stands can occur on very wet sites on organic soils. Lodgepole pine is the dominant seral species and forms widespread forests along with minor amounts of white spruce and/or black spruce. Trembling aspen is common as a seral species at lower elevations.

This variant provides summer habitat for moose, black bear and grizzly bear. Rocky Mountain elk and mule deer make somewhat limited use of this habitat.

3.5.2 Graham BWBSwk - BWBSwk2 (previously BWBSd2)

The BWBSwk2 Variant covers the foothills and mid to lower slopes of the Rocky Mountains from the Hackney Hills north to where the Sikanni Chief River drains out of the Rocky Mountains. It occurs at elevations between 1050 and 1200 m. The BWBSwk2 is slightly wetter and warmer over the growing season than the BWBSwk1. It also has a longer growing season, but colder winters with less snowpack.

The forests are very similar to those of the BWBSwk1 variant.

This variant provides summer habitat for moose, mule deer, black bear and grizzly bear. Rocky Mountain elk have recently been repatriated to the southerly facing slopes of the Peace River Canyon and will use this habitat in the summer.

3.5.3 Kledo BWBSwk - BWBSwk3 (previously BWBSb)

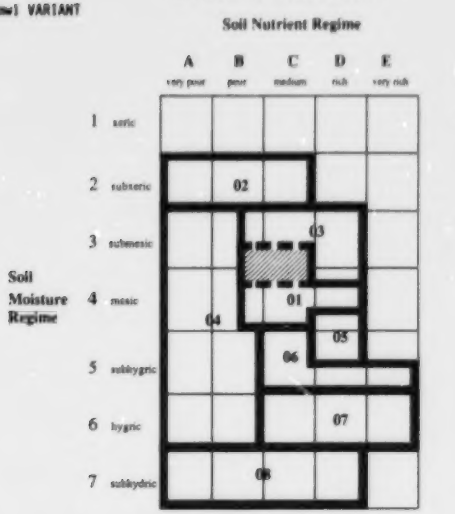
The BWBSwk3 variant occurs as isolated pockets in the Rocky Mountain foothills between 900 and 1200 m from the Sikanni Chief River north to the Northwest Territories border.

There is very little climatic data available from this variant, but it is assumed to have a similar climate to the other BWBSwk variants. Lodgepole pine - black spruce - white spruce forests dominate the landscape. The BWBSwk3 will not be discussed further in this text.

This variant provides summer habitat for black bear and, to a lesser extent, moose. It is used year-round by spruce grouse and blue grouse.

NOTES

4 THE BWBSmw1 VARIANT



Site Series
01 SwAt - Step moss
02 Pl - Lingonberry - Velvet-leaved blueberry
03 Sw - Wildrye - Peavine
04 Sb - Lingonberry - Coltsfoot
05 Sw - Currant - Oak fern
06 Sw - Currant - Bluebells
07 Sw - Currant - Horsetail
08 Sb - Labrador tea - Sphagnum

FIGURE 2. Edatopic grid displaying site series in the BWBSmw1 variant.

KEY TO SITE UNITS OF THE BWBSmw1

1a Canopy dominated by black spruce or by a combination of black spruce and lodgepole pine; sites usually level

2a Canopy dominated by black spruce, lodgepole pine rare or absent, tamarack occasionally present; Equisetum spp. (p. 24)[6] commonly present and often abundant; soils organic or fluvial
BWBSmw1/08

2b Canopy a combination of lodgepole pine and black spruce; Equisetum spp. usually very low cover (<1%) or absent; soils morainal or (glacio)fluvial
BWBSmw1/04

1b Canopy dominated by lodgepole pine or white spruce, black spruce minor or absent

3a Canopy dominated by white spruce or trembling aspen-white spruce, lodgepole pine rare or absent

4a Canopy often a mixture of lodgepole pine and white spruce or trembling aspen and white spruce; Gymnocarpium dryopteris (p. 26), Delphinium glaucum (tall larkspur) and/or Equisetum spp. (p. 24) usually absent
BWBSmw1/01

4b Canopy white spruce or a mixture of white spruce and balsam poplar; Gymnocarpium dryopteris, Delphinium glaucum or Equisetum spp. present

5a Sites usually level; Equisetum spp. (p. 24) abundant (usually >20%)
BWBSmw1/07

5b Site position variable, but usually not level; Equisetum spp. low cover (<1%) or absent

6a Aspect usually northerly; Sorbus scopulina (western mountain-ash) usually present, Gymnocarpium dryopteris moderate to high cover (usually >10%)
BWBSmw1/05

6b Aspect generally not northerly; Sorbus scopulina and Gymnocarpium dryopteris low cover (<1% each) or absent
BWBSmw1/06

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6 Page numbers refer to the publication "Some Common Plants of the Sub-Boreal Spruce Zone" (Pojar et al. 1982).

3b Canopy dominated by lodgepole pine or a combination of lodgepole pine and white spruce

7a Canopy usually pure lodgepole pine, white spruce absent; mid to upper slope; moss layer primarily Cladina spp. (p. 55)

BWSmw1/02

7b Canopy usually a combination of lodgepole pine and white spruce; slope position variable; moss layer primarily Hylocomium splendens (p. 60) and Pleurozium schreberi (p. 61)

8a Generally mid to upper slope or if not then soils coarse; Elymus innovatus (fuzzy-spiked wildrye) usually present, if not then shrub and herb layer poorly developed; often on south- or west-facing aspects

BWSmw1/[illegible]

8b Slope position variable; Elymus innovatus low cover (<1%) or absent, shrub and herb layer well developed; aspect variable

BWSmw1/01

BWBSmw1/01

SwAt - STEP MOSS

VEGETATION

trembling aspen

Tree Layer: 40% cover
White spruce, trembling aspen, lodgepole pine, balsam poplar

Shrub Layer: 25% cover

Rosa acicularis	(prickly rose)
Viburnum edule	(highbush-cranberry)
white spruce	

Herb Layer: 55% cover

Cornus canadensis	(bunchberry)
Linnaea borealis	(twinflower)
Rubus pubescens	(trailing raspberry)
Mertensia paniculata	(tall bluebells)
Petasites palmatus	(palmate coltsfoot)
Pyrola asarifolia	(pink wintergreen)
Orthilia secunda	(one-sided wintergreen)
Epilobium angustifolium	(fireweed)
Lathyrus ochroleucus	(creamy peavine)
Mitella nuda	(common mitrewort)
Arnica cordifolia	(heart-leaved arnica)
Elymus innovatus	(fuzzy-spiked wildrye)

Rosa acicularis

Moss Layer: 55% cover

Hylocomium splendens	(step moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)

SOIL AND SITE

Moisture Regime:	(submesic) - mesic
Nutrient Regime:	poor - rich
Slope Gradient (%):	0-65 (usually less than 20)
Slope Position:	upper - lower
Parent Material:	(glacio)fluvial, morainal occ.lacustrine
Soil Texture:	moderately fine to coarse
Coarse Fragments (%):	0-65 (usually less than 20)
Site Index (m @ 100yrs):	Pl 24 (18-29) Sw 25 (18-32)

Hylocomium splendens

DISTRIBUTION: very common

SWAT - STEP MOSS (BWBSmw1/01)

INTERPRETATIONS

Logging:	- clearcut - trafficability may be a problem in spring or after a long duration of rain in summer
Site preparation:	
Objective	- reduce debris; prepare planting spots; minimize future brush competition; improve planter access; increase soil temperature
Mechanical	- patch scarify; plow; winter ripper plow
Prescribed fire	- pile and burn
Species choice:	
Preferred	- Sw, Pl
Acceptable	- At
Brush hazard:	- very high (trembling aspen, bluejoint, fireweed) - brush competition will require post-planting inspections of harvested sites; these inspections may indicate the need to control vegetation competition
Reforestation:	- if stand has a large component of lodgepole pine and cone survey indicates adequate seed, natural stocking may be achievable - to achieve natural stocking, humus depth must be reduced and seed dispersed
Concerns:	- windthrow - root rot (if managing for Sw) - compaction - drought - increasing soil temperature may be as important as reducing vegetation competition for improving seedling performance - herbicide use to control brush competition may conflict with wildlife needs

BWBSmw1/02

P1 - LINGONBERRY - VELVET-LEAVED BLUEBERRY

VEGETATION

Tree Layer: 30% cover
Lodgepole pine, white spruce

Shrub Layer: 30% cover
Spiraea betulifolia (birch-leaved spirea)
Vaccinium myrtilloides (velvet-leaved blueberry)
white spruce
lodgepole pine

lodgepole pine

Herb Layer: 55% cover
Arctostaphylos uva-ursi (kinnikinnick)
Geocaulon lividum (bastard toadflax)
Elymus innovatus (fuzzy-spiked wildrye)
Lathyrus ochroleucus (creamy peavine)
Maianthemum canadense (wild lily-of-the valley)
Fragaria virginiana (wild strawberry)
Oryzopsis pungens (short-awned ricegrass)
Pyrola chlorantha (green wintergreen)
Orthilia secunda (one-sided wintergreen)
[Vaccinium vitis-idaea (lingonberry)]

Spiraea betulifolia

Moss Layer: 65% cover
Cladina spp.
Hylocomium splendens (step moss)
Pleurozium schreberi (red-stemmed feathermoss)
Polytrichum juniperinum (juniper haircap moss)

SOIL AND SITE

Moisture Regime:	subxeric
Nutrient Regime:	poor - (medium)
Slope Gradient (%):	0-40
• Slope Position:	upper to crest or level
Parent Material:	usually (glacio)fluvial
• Soil Texture:	medium to coarse
Coarse Fragments (%):	0-30
Site Index (m @ 100 yr):	P1 20

DISTRIBUTION: uncommon

Vaccinium myrtilloides

Pl - LINGONBERRY - VELVET-LEAVED BLUEBERRY (BWBSmw1/02)

INTERPRETATIONS

Logging:	- clearcut - full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensured if you are managing for naturals
Site preparation:	
Objective	- enhance natural regeneration; improve moisture status; reduce debris; improve planter access; protect thin humus forms
Mechanical	- light drag scarify*; disc trench; mix humus with mineral soil
Prescribed fire	- do not burn
Species choice:	
Preferred Acceptable	- Pl
Brush hazard:	- low
Reforestation:	- conduct a Pl cone survey to determine seed adequacy for establishing a natural Pl stand. If cones are insufficient, plant Pl stock.
Concerns:	- drought - mistletoe - the humus forms on these sites are thin and removal of any portion of the humus layer may seriously affect site productivity - because of the low productivity of these sites, large silviculture expenditures may be difficult to justify, and management must ensure that productivity is not further reduced

BWBSmw1/03

Sw - WILDRYE - PEAVINE

VEGETATION

Tree Layer: 35% cover
Lodgepole pine, white spruce

Shepherdia canadensis

Shrub Layer: 25% cover

Rosa acicularis	(prickly rose)
Viburnum edule	(highbush-cranberry)
Shepherdia canadensis	(soopolallie)
Spiraea betulifolia	(birch-leaved spirea)
white spruce	
trembling aspen	

Herb Layer: 50% cover

Linnaea borealis	(twinflower)
Elymus innovatus	(fuzzy-spiked wildrye)
Cornus canadensis	(bunchberry)
Epilobium angustifolium	(fireweed)
Rubus pubescens	(trailing raspberry)
Lathyrus ochroleucus	(creamy peavine)
Arnica cordifolia	(heart-leaved arnica)
Orthilia secunda	(one-sided wintergreen)
Petasites palmatus	(palmate coltsfoot)
Pyrola asarifolia	(rosy wintergreen)
Mertensia paniculata	(tall bluebells)
Aster conspicuus	(showy aster)
Maianthemum canadense	(false lily-of-the-valley)

Elymus innovatus

Moss Layer: 75% cover

Hylocomium splendens	(step moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)

SOIL AND SITE

Moisture Regime:	submesic - (mesic)
Nutrient Regime:	poor - medium
Slope Gradient (%):	0-60
Slope Position:	variable
* Parent Material:	variable, often (glacio)fluvial
* Soil Texture:	medium to coarse
Coarse Fragments (%):	0-80
Site Index (@ 100yrs):	Pl 24 (22-30)
	Sw 24 (20-32)

Lathyrus ochroleucus

DISTRIBUTION: uncommon

SW - WILDRYE - PEAVINE (BWBSmw1/03)

INTERPRETATIONS

Logging:	- clearcut - full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensured if managing for naturals
Site preparation:	
Objective	- enhance natural regeneration; improve moisture status; reduce debris; improve planter access; protect thin humus forms
Mechanical	- light drag scarify; disc trench; mix humus with mineral soil
Prescribed fire	- do not burn
Species choice:	
Preferred Acceptable	- Pl
Brush hazard:	- low
Reforestation:	- conduct a Pl cone survey to determine seed adequacy for establishing a natural Pl stand. If cones are insufficient, plant Pl stock.
Concerns:	- drought - the humus forms on these sites are often thin and removal of any portion of the humus layer may seriously affect site productivity

BWBSmw1/04

Sb - LINGONBERRY - COLTSFOOT

VEGETATION

Tree Layer: 35% cover
Lodgepole pine, (black spruce)

black spruce

Shrub Layer: 40% cover

Rosa acicularis	(prickly rose)
Ledum groenlandicum	(Labrador tea)
Viburnum edule	(highbush-cranberry)
black spruce	

Herb Layer: 35% cover

Cornus canadensis	(bunchberry)
Linnaea borealis	(twinflower)
Vaccinium vitis-idaea	(lingonberry)
Epilobium angustifolium	(fireweed)
Petasites palmatus	(palmate coltsfoot)
Vaccinium caespitosum	(dwarf blueberry)

Moss Layer: 75% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Hylocomium splendens	(step moss)
Peltigera aphthosa	
Ptilium crista-castrensis	(knight's plume)

Ledum groenlandicum

SOIL AND SITE

	Moisture Regime:	submesic - subhygric
	Nutrient Regime:	(very poor -) medium
*	Slope Gradient (%):	0-10
*	Aspect:	usually north-facing if sloping
*	Slope Position:	usually level
	Parent Material:	morainal, lacustrine or (glacio)fluvial
	Soil Texture:	fine to coarse
	Coarse Fragments (%):	0-70
	Site Index (m @ 100yrs):	Pl 20 (13-27)
		Sw 20 (13-28)

Vaccinium vitis-idaea

DISTRIBUTION: common

SB - LINGONBERRY - COLTSFOOT (BWBSmw1/04)

INTERPRETATIONS

Logging:
- clearcut
- full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensured if managing for naturals
- trafficability will be a problem on these sites during the spring and after precipitation events in the summer

Site preparation:

Objective
- enhance natural regeneration; improve moisture status; reduce debris; improve planter access; increase soil temperatures; protect thin humus forms

Mechanical
- light drag scarify; mix humus with mineral soil

Prescribed fire
- do not burn

Species choice:

Preferred
Acceptable
- Pl

Brush hazard:
- low

Reforestation:
- conduct a Pl cone survey to determine seed adequacy for establishing a natural Pl stand. If cones are insufficient, plant Pl stock.
- natural stocking could take up to 5 years

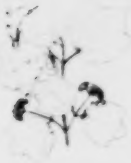
Concerns:
- drought
- compaction
- high water table in spring
- the humus forms on these sites are often thin and removal of any portion of the humus layer may seriously affect site productivity
- because of the low productivity of most of these sites large silviculture expenditures may be difficult to justify, and management must ensure that productivity is not further reduced

BWBSmw1/05

Sw - CURRANT - OAK FERN

VEGETATION

Tree Layer: 30% cover
White spruce



Viburnum edule

Shrub Layer: 40% cover

Viburnum edule	(highbush-cranberry)
Sorbus scopulina	(western mountain-ash)
Rosa acicularis	(prickly rose)
Lonicera involucrata	(black twinberry)
Ribes lacustre	(black gooseberry)
Alnus viridis ssp. sinuata	(Sitka alder)
[Oplopanax horridus	(devil's club)]
[Ribes triste	(red swamp currant)]

Herb Layer: 60% cover

Cornus canadensis	(bunchberry)
Gymnocarpium dryopteris	(oak fern)
Mitella nuda	(common mitrewort)
Linnaea borealis	(twinflower)
Smilacina racemosa	(false Solomon's-seal)
Rubus pubescens	(trailing raspberry)
Petasites palmatus	(palmate coltsfoot)
Osmorhiza chilensis	(sweet-cicely)
Galium triflorum	(sweet-scented bedstraw)
[Calamagrostis canadensis	(bluejoint)]

Ribes triste

Moss Layer: 55% cover

Hylocomium splendens	(step moss)
[Pleurozium schreberi	(red-stemmed feathermoss)]

SOIL AND SITE

	Moisture Regime:	(mesic) - subhygric
	Nutrient Regime:	(medium) - rich
	Slope Gradient (%):	3-25
•	Slope Position:	mid - lower
	Parent Material:	variable
•	Soil Texture:	medium to fine
	Coarse Fragments (%):	10-22
	Site Index	Sx 29 (28-30)

Gymnocarpium dryopteris

COMMENTS: These sites can have a moderate to high cover of Oplopanax horridus (devil's club).

DISTRIBUTION: uncommon

SW - CURRANT - OAK FERN (BWBSmw1/05)

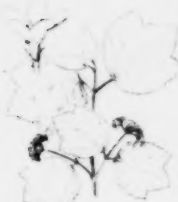
INTERPRETATIONS

Logging:	- clearcut - trafficability may be a problem if long durations of rainfall occur
Site preparation:	
Objective	- reduce debris; prepare planting spots; minimize future brush competition; improve planter access; increase soil temperature
Mechanical	- patch scarify; mound; plow; winter ripper plow
Prescribed fire	- pile and burn; broadcast burn*
Species choice:	
Preferred	- Sw
Acceptable	- Pl
Brush hazard:	- very high (black twinberry, fireweed) - brush competition will require post-planting inspections of harvested sites to determine the need for vegetation control
Reforestation:	- use large planting stock
Concerns:	- windthrow - root rot (if managing for Sw) - compaction - herbicide use to control brush competition may conflict with wildlife needs

BWBSmw1/06

Sw - CURRANT - BLUEBELLS

VEGETATION



Viburnum edule

Tree Layer: 35% cover
White spruce

Shrub Layer: 50% cover

Viburnum edule	(highbush-cranberry)
Rosa acicularis	(prickly rose)
Ribes triste	(red swamp currant)
Lonicera involucrata	(black twinberry)
Ribes oxyacanthoides	(northern gooseberry)
Ribes lacustre	(black gooseberry)
(Cornus sericea)	(red-osier dogwood)
trembling aspen	
white spruce	

Ribes triste

Herb Layer: 60% cover

Cornus canadensis	(bunchberry)
Epilobium angustifolium	(fireweed)
Linnaea borealis	(twinflower)
Rubus pubescens	(trailing raspberry)
Mertensia paniculata	(tall bluebells)
Petasites palmatus	(palmate coltsfoot)
Mitella nuda	(common mitrewort)
Lathyrus ochroleucus	(creamy peavine)
Pyrola asarifolia	(pink wintergreen)
Calamagrostis canadensis	(bluejoint)
Pyrola chlorantha	(green wintergreen)
Orthilia secunda	(one-sided wintergreen)
Viola spp.	(violets)
[Galium triflorum	(sweet-scented bedstraw)]

Moss Layer: 55% cover

Hylocomium splendens	(step moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
[Mnium spp.	(leafy mosses)]

H. paniculata

SOIL AND SITE

Moisture Regime:	(mesic) - subhygric
Nutrient Regime:	(medium) - rich
Slope Gradient (%):	0-35
Slope Position:	upper to lower or level
Parent Material:	variable
* Soil Texture:	medium to fine
Coarse Fragments (%):	0-40
* Seepage Water:	often present
Site Index (m @ 100yrs):	Sw 28 (21-36)
	Pl 24 (18-28)

DISTRIBUTION: common

SW - CURRANT - BLUEBELLS (BWBSmw1/06)

INTERPRETATIONS

Logging:	- clearcut - trafficability may be a problem after heavy rainfall
Site preparation:	
Objective	- reduce debris; prepare planting spots; minimize future brush competition; improve planter access; increase soil temperature
Mechanical	- patch scarify; mound; plow*; winter ripper plow
Prescribed fire	- pile and burn
Species choice:	
Preferred	- Sw
Acceptable	- Pl
Brush hazard:	- extreme (bluejoint, trembling aspen, fireweed) - brush competition will require post-planting inspections of harvested sites to determine the need for vegetation control
Reforestation:	- use large planting stock
Concerns:	- windthrow - root rot (if managing for Sw) - compaction - herbicide use to control brush competition may conflict with wildlife needs

BWBSmw1/07

Sw - CURRANT - HORSETAIL

VEGETATION

Rosa acicularis

Tree Layer: 40% cover
White spruce

Shrub Layer: 30% cover

Rosa acicularis	(prickly rose)
Viburnum edule	(highbush-cranberry)
Lonicera involucrata	(black twinberry)
Ribes lacustre	(black gooseberry)
Ribes triste	(red swamp currant)
(Cornus sericea)	(red-osier dogwood)

Herb Layer: 65% cover

Equisetum spp. (arvense, pratense)	(horsetails)
Mertensia paniculata	(tall bluebells)
Petasites palmatus	(palmate coltsfoot)
Linnaea borealis	(twinflower)
Rubus pubescens	(trailing raspberry)
Cornus canadensis	(bunchberry)
Mitella nuda	(common mitrewort)

Moss Layer: 60% cover

Hylocomium splendens	(step moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)

Ribes triste

SOIL AND SITE

	Moisture Regime:	(subhygric) - hygric
	Nutrient Regime:	medium - rich
*	Slope Gradient (%):	0-36; usually less than 5
*	Slope Position:	usually level (mid - lower)
*	Parent Material:	lacustrine, fluvial
	Soil Texture:	moderately coarse to fine
	Coarse Fragments (%):	0-20 (usually 0)
	Site Index (m @ 100yrs):	Sw 24 (21-33)

DISTRIBUTION: uncommon

Equisetum arvense

SW - CURRANT - HORSETAIL (BWBSmw1/07)

INTERPRETATIONS

Logging:	- clearcut - trafficability will be a problem when ground not frozen
Site preparation:	
Objective	- reduce debris; prepare raised planting spots; minimize future brush competition; improve planter access; increase soil temperature
Mechanical	- mound*
Prescribed fire	- broadcast burn
Species choice:	
Preferred Acceptable	- Sw
Brush hazard:	- high (bluejoint, willows, balsam poplar) - brush competition will require post-planting inspections of harvested sites to determine the need for vegetation control
Reforestation:	- plant after water table drops below ground level and plant on drier microsites - use large planting stock
Concerns:	- root rot - compaction - this association is critical to the control of runoff and stream flow - windthrow hazard is extreme - water table will likely rise above the ground surface in the spring, causing seedling mortality - herbicide use to control brush competition may conflict with wildlife needs

BWBSmw1/08

Sb - LABRADOR TEA - SPHAGNUM

VEGETATION

Tree Layer: 25% cover
Black spruce

Shrub Layer: 50% cover

Ledum groenlandicum	(Labrador tea)
Salix spp.	(willows)
Rosa acicularis	(prickly rose)
Viburnum edule	(highbush-cranberry)
black spruce	

Ledum groenlandicum

Herb Layer: 60% cover

Equisetum scirpoides	(dwarf scouring-rush)
Petasites palmatus	(palmate coltsfoot)
Vaccinium vitis-idaea	(lingonberry)
Mitella nuda	(common mitrewort)
Equisetum sylvaticum	(wood horsetail)
Mitella nuda	(common mitrewort)
Moneses uniflora	(single delight)
Equisetum arvense	(common horsetail)
Cornus canadensis	(bunchberry)
Rubus pubescens	(trailing raspberry)

Equisetum scirpoides

Moss Layer: 90% cover

Hylocomium splendens	(step moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Aulacomnium palustre	(glow moss)
Ptilium crista-castrensis	(knight's plume)
Sphagnum spp.	(sphagnum mosses)
Peltigera aphthosa	

SOIL AND SITE

	Moisture Regime:	hygric - subhydric
	Nutrient Regime:	very poor - poor
*	Slope Gradient (%):	0-12 (usually 0)
*	Slope Position:	variable, often depression
*	Parent Material:	organic or fluvial
*	Soil Texture:	mesic, fibric if organic; medium if fluvial
	Coarse Fragments (%):	0-4; usually 0
	Site Index (m @ 100yrs):	Sw 20 (17-23) Lt 17

DISTRIBUTION: common

Sphagnum spp.

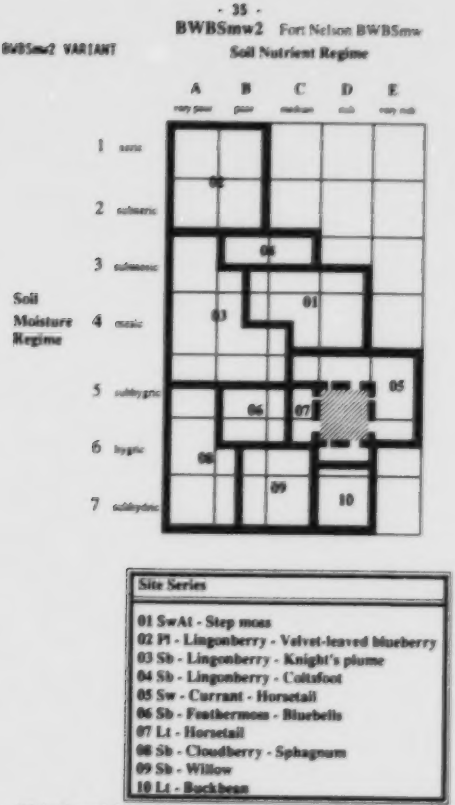
SB - LABRADOR TEA - SPHAGNUM (BWBSmw1/08)

INTERPRETATIONS

Management objectives: - non-commercial at this time

NOTES

5 THE BWBSmw2 VARIANT



Site Series
01 SwAt - Step moss
02 Pl - Lingonberry - Velvet-leaved blueberry
03 Sb - Lingonberry - Knight's plume
04 Sb - Lingonberry - Coltsfoot
05 Sw - Currant - Horsetail
06 Sb - Feathermoss - Bluebells
07 Lt - Horsetail
08 Sb - Cloudberry - Sphagnum
09 Sb - Willow
10 Lt - Buckbean

FIGURE 3. Edatopic grid displaying site series in the BWBSmw2 variant.

KEY TO SITE UNITS OF THE BWBSmw2

1a Site occurs on level to gently sloping river terraces

  2a Canopy dominated by white spruce

    BWBSmw2/05

  2b Canopy dominated by balsam poplar

    BWBSmw2/05-S

1b Site occurs on level to moderately sloping uplands, or on level to depressional wetlands

  3a Site occurs on level to moderately sloping uplands

    4a Canopy dominated by white spruce and/or trembling aspen; soils moderately fine textured

      5a White spruce dominant

        BWBSmw2/01

      5b Trembling aspen dominant

        BWBSmw2/01-S

    4b Canopy dominated by lodgepole pine, or by black spruce and lodgepole pine; soils variable

      6a Canopy dominated by lodgepole pine

        7a High cover (>15%) of lichens; soils coarse textured

          BWBSmw2/02

        7b Low to moderate cover (<15%) of lichens; soils variable

          8a Black spruce very rare or absent in the canopy and in regeneration; Lycopodium annotinum (p. 28)[7] moderate cover (>7%)

            BWBSmw2/04

          8b Black spruce present in canopy and the dominant regeneration; Lycopodium annotinum very low cover (<1%) or absent

            BWBSmw2/03

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[7] Page numbers refer to the publication "Some Common Plants of the Sub-Boreal Spruce Zone" (Pojar et al. 1982).

6b Canopy dominated by black spruce and lodgepole pine.

9a *Equisetum* spp. high cover (>10%) (p. 24)

BWBSmw2/06

9b *Equisetum* spp. low cover (<1%) or absent

BWBSmw2/03

3b Site occurs on level to depressional wetlands

10a Canopy dominated by black spruce

11a Shrub layer dominated by *Ledum groenlandicum* (p. 9); moss layer dominated by *Sphagnum fuscum* (a sphagnum moss)

BWBSmw2/08

11b Shrub layer dominated by *Salix* spp. (p. 12); moss layer dominated by *Aulacomnium palustre* (p. 58)

BWBSmw2/09

10b Canopy dominated by tamarack

12a Shrub layer not dominated by *Betula glandulosa* (p. 8); moderate to high cover (>10%) of horsetails

BWBSmw2/07

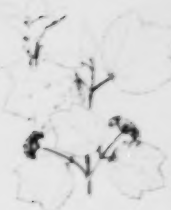
12b Shrub layer dominant by *Betula glandulosa*; horsetails very low cover (<1%) or absent

BWBSmw2/10

BWBSmw2/01

SwAt - STEP MOSS

VEGETATION



Viburnum edule

Tree Layer: 70% cover
White spruce, trembling aspen, black spruce

Shrub Layer: 20% cover

Viburnum edule	(highbush-cranberry)
Rosa acicularis	(prickly rose)
white spruce	

Herb Layer: 20% cover

Linnaea borealis	(twinflower)
Cornus canadensis	(bunchberry)
Rubus pubescens	(trailing raspberry)
Orthilia secunda	(one-sided wintergreen)
Mertensia paniculata	(tall bluebells)
Mitella nuda	(common mitrewort)
Viola renifolia	(kidney-leaved violet)
Vaccinium vitis-idaea	(lingonberry)

Moss Layer: 60% cover

Hylocomium splendens	(step moss)
Ptilium crista-castrensis	(knight's plume)
Pleurozium schreberi	(red-stemmed feathermoss)

Linnaea borealis

SOIL AND SITE

Moisture Regime:	(submesic) - mesic
Nutrient Regime:	poor - rich
• Slope Gradient (%):	0-22
• Slope Position:	level, upper to mid
Parent Material:	morainal, glaciofluvial, lacustrine
• Soil Texture:	moderately fine
Coarse Fragments:	few
Site Index (m @ 100yrs):	Sw 22 (21-27) Pl 20

DISTRIBUTION: very common

Hylocomium splendens

SWAT - STEP MOSS (BWBSmw2/01)

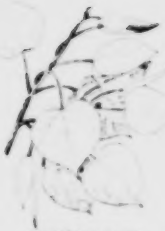
INTERPRETATIONS

Logging:	- clearcut
Site preparation:	
Objective	- reduce debris; prepare planting spots; minimize future brush competition; improve planter access; increase soil temperature
Mechanical	- patch scarify; plow; winter ripper plow; windrow and burn
Prescribed fire	- broadcast burn
Species choice:	
Preferred	- Sw
Acceptable	- Pl, At
Brush hazard:	- high (bluejoint, willow, alder, fireweed, trembling aspen if managing for spruce) - brush competition will require post-planting inspections of harvested sites to determine the need for vegetation control - large vigorous stock should be planted as soon as possible after site preparation - hack and squirt aspen 2 years prior to harvest - if birch is present remove to reduce seeding in potential - 3 m knockdown of all residuals to facilitate an aerial brushing and weeding progra- - removal of duff layer down to mineral soil during site preparation will accelerate the invasion of bluejoint (Calamagrostis canadensis) unless the duff and soil layers are turned over (e.g., mounding or plowing)
Reforestation:	
Concerns:	- frost heaving - drought (from drying duff layer) - compaction - erosion

BWBSmw2/01 - $

$ At - Sw - STEP MOSS

VEGETATION



trembling aspen

Tree Layer: 60% cover
Trembling aspen, (white spruce)

Shrub Layer: 75% cover

Viburnum edule	(highbush-cranberry)
Rosa acicularis	(prickly rose)
Alnus viridis ssp. fruticosa	(green alder)
Salix bebbiana	(Bebb's willow)
Ribes oxyacanthoides	(northern gooseberry)
Cornus sericea	(red-osier dogwood)
Lonicera dioica	(red honeysuckle)
Amelanchier alnifolia	(saskatoon)

white spruce

Viburnum edule

Herb Layer: 40% cover

Linnaea borealis	(twinflower)
Cornus canadensis	(bunchberry)
Rubus pubescens	(trailing raspberry)
Aralia nudicaulis	(wild sarsaparilla)
Lathyrus ochroleucus	(creamy peavine)
Orthilia secunda	(one-sided wintergreen)
Mertensia paniculata	(tall bluebells)
Mitella nuda	(common mitrewort)
Maianthemum canadense	(false lily-of-the-valley)
Galium boreale	(northern bedstraw)
Pyrola asarifolia	(pink wintergreen)
Viola renifolia	(kidney-leaved violet)
Epilobium angustifolium	(fireweed)

Moss Layer: 40% cover

Mylocomium splendens	(step moss)
Ptilium crista-castrensis	(knight's plume)
Eurhynchium pulchellum	

Linnaea borealis

SOIL AND SITE

	Moisture Regime:	(submesic -) mesic
	Nutrient Regime:	poor - rich
*	Slope Gradient (%):	0-22
*	Slope Position:	level, upper to mid
	Parent Material:	morainal, glaciofluvial, lacustrine
*	Soil Texture:	moderately fine
	Coarse Fragments:	few

DISTRIBUTION: very common

$ AT - SW - STEP MOSS (BWBSmw2/01-$)

INTERPRETATIONS

Logging:

- clearcut aspen stands that have less than 900 stems/ha spruce
- avoid logging stands that have between 900-1050 stems/ha spruce
- protect spruce regeneration in stands that have more than 1050 stems/ha

Site preparation:

Objective
- as 01 if you are managing for planted spruce
- stimulate aspen suckering if managing for aspen

Prescribed fire
- broadcast burn

Species choice:

Preferred
- Sw, At

Acceptable
- Pl

Brush hazard:

- high (bluejoint, alder, fireweed and willow)
- no site preparation is necessary if you are managing site for aspen, but broadcast burning will enhance stocking
- identify dense patches of Sw and skid around them when logging
- a sanitation spacing may be required at some point in the future if advanced Sw regeneration has been protected
- protecting advance Sw regeneration will be difficult and may require modified harvesting techniques using smaller more manouvrable equipment, and designated rather than random skid trails
- conifer release in naturally occurring stands of At with an Sw understory should be reassessed based on the potential value ot the At

Reforestation:

Concerns:

- maintenance of Sw understory
- frost heaving
- drought
- compaction
- heavy aspen slash load

BWBSmw2/02

P1 - LINGONBERRY - VELVET-LEAVED BLUEBERRY

VEGETATION

Tree Layer: 40% cover
Lodgepole pine, trembling aspen, black spruce, (white spruce, jack pine)

lodgepole pine

Shrub Layer: 30% cover

Rosa acicularis	(prickly rose)
Ledum groenlandicum	(Labrador tea)
Shepherdia canadensis	(soopolallie)
Alnus viridis ssp. fruiticosa	(green alder)
Viburnum edule	(highbush-cranberry)
Vaccinium myrtilloides	(velvet-leaved blueberry)
black spruce	
white spruce	

Herb Layer: 50% cover

Vaccinium vitis-idaea	(lingonberry)
Arctostaphylos uva-ursi	(kinnikinnick)
Linnaea borealis	(twinflower)
Cornus canadensis	(bunchberry)
Geocaulon lividum	(bastard toadflax)
Epilobium angustifolium	(fireweed)
Pyrola asarifolia	(pink wintergreen)
Pyrola chlorantha	(green wintergreen)

Vaccinium vitis-idaea

Moss Layer: 50% cover

Cladina spp.	
Pleurozium schreberi	(red-stemmed feathermoss)
Hylocomium splendens	(step moss)
Cladonia spp.	
Peltigera spp.hosa	

SOIL AND SITE

Moisture Regime:	xeric - subxeric
Nutrient Regime:	very poor - poor
Slope Gradient (%):	0
* Slope Position:	crest
* Parent Material:	fluvial, eolian
* Soil Texture:	moderately coarse - coarse

DISTRIBUTION: rare

Cladina spp.

PL - LINGONBERRY - VELVET-LEAVED BLUEBERRY (BWBSmw2/02)

INTERPRETATIONS

Management objectives: - non commercial at this time

BWBSmw2/03

Sb - LINGONBERRY - KNIGHT'S PLUME

VEGETATION

Tree Layer: 40% cover
Lodgepole pine, trembling aspen, (white spruce)

Ledum groenlandicum

Shrub Layer: 50% cover

Ledum groenlandicum	(Labrador tea)
Viburnum edule	(highbush-cranberry)
Rosa acicularis	(prickly rose)
Salix bebbiana	(Bebb's willow)
Salix scouleriana	(Scouler's willow)
Shepherdia canadensis	(soopolallie)
trembling aspen	
white spruce	
black spruce	

Herb Layer: 60% cover

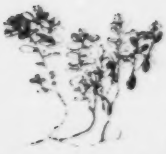
Cornus canadensis	(bunchberry)
Vaccinium vitis-idaea	(lingonberry)
Epilobium angustifolium	(fireweed)
Lycopodium annotinum	(stiff clubmoss)
Elymus innovatus	(fuzzy-spiked wildrye)
Linnaea borealis	(twinflower)
Lathyrus ochroleucus	(creamy peavine)
Orthilia secunda	(one-sided wintergreen)
Maianthemum canadense	(false lily-of-the-valley)
Equisetum sylvaticum	(wood horsetail)
Equisetum arvense	(common horsetail)
Equisetum pratense	(meadow horsetail)
Viola renifolia	(kidney-leaved violet)
Lycopodium complanatum	(ground cedar)
Pyrola asarifolia	(pink wintergreen)

Viburnum edule

Moss Layer: 70% cover

Hylocomium splendens	(step moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Peltigera aphthosa	

SOIL AND SITE



Vaccinium vitis-idaea

	Moisture Regime:	submesic
	Nutrient Regime:	poor - medium
*	Slope Gradient (%):	0-5
*	Slope Position:	crest to upper, level
	Parent Material:	morainal, (eolian)
*	Soil Texture:	fine - moderately fine
	Site Index (m @ 100 yr):	Pl 17 (15-22)

DISTRIBUTION: uncommon

SB - LINGONBERRY - KNIGHT'S PLUME (BWBSmw2/03)

INTERPRETATIONS

Logging:	- clearcut - trafficability will be a problem on these sites after snowmelt or heavy rains - full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensured if you are managing for naturals
Site preparation:	
Objective	- enhance natural regeneration; improve moisture status; reduce debris; improve planter access; increase soil temperatures; protect thin humus forms
Mechanical	- light drag scarify; mix humus with mineral soil
Prescribed fire	- do not burn
Species choice:	
Preferred Acceptable	- Pl
Brush hazard:	- low
Reforestation:	- conduct a Pl cone survey to determine potential seed supply. If cones are insufficient, plant Pl stock.
Concerns:	- drought - compaction - high water table in spring - the humus forms on these sites are often thin and removal of any portion of the humus layer may seriously affect site productivity - because of the low productivity of these sites, large silviculture expenditures may be difficult to justify, and management must ensure that productivity is not further reduced

BWBSmw2/04

Sb - LINGONBERRY - COLTSFOOT

VEGETATION

Tree Layer: 65% cover
Black spruce, lodgepole pine

Shrub Layer: 8% cover
Ledum groenlandicum (Labrador tea)
black spruce

Herb Layer: 15% cover
Cornus canadensis (bunchberry)
Vaccinium vitis-idaea (lingonberry)

Moss Layer: 75% cover
Pleurozium schreberi (red-stemmed feathermoss)
Hylocomium splendens (step moss)
Ptilium crista-castrensis (knight's plume)
Peltigera aphthosa

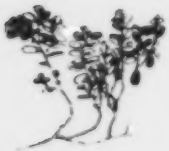
black spruce

SOIL AND SITE

Moisture Regime:	submesic - subhygric
Nutrient Regime:	very poor - medium
* Slope Gradient (%):	0-12
* Slope Position:	lower, toe
Parent Material:	morainal, glaciofluvial, lacustrine
Soil Texture:	variable

DISTRIBUTION: very common

Ledum groenlandicum



Vaccinium vitis-idaea

SB - LINGONBERRY - COLTSFOOT (BWBSmw2/04)

INTERPRETATIONS

Management objectives: - non-commercial at this time

BWBSmw2/05

Sw - CURRANT - HORSETAIL

VEGETATION

Rosa acicularis

Tree Layer: 45% cover
White spruce, paper birch

Shrub Layer: 35% cover

Rosa acicularis	(prickly rose)
Viburnum edule	(highbush-cranberry)
Alnus incana ssp. tenuifolia	(mountain alder)
Ribes oxyacanthoides	(northern gooseberry)
Cornus sericea	(red-osier dogwood)
Ribes triste	(red swamp currant)
white spruce	

Herb Layer: 70% cover

Cornus canadensis	(bunchberry)
Mitella nuda	(common mitrewort)
Goodyera repens	(dwarf rattlesnake orchid)
Equisetum pratense	(meadow horsetail)
Equisetum scirpoides	(dwarf scouring-rush)
Rubus pubescens	(trailing raspberry)
Pyrola asarifolia	(pink wintergreen)
Linnaea borealis	(twinflower)
Mertensia paniculata	(tall bluebells)
Viola renifolia	(kidney-leaved violet)
Galium triflorum	(sweet-scented bedstraw)
Calamagrostis canadensis	(bluejoint)

Moss Layer: 3-75% cover (depending on time since last flood)

Hylocomium splendens	(step moss)
Ptilium crista-castrensis	(knight's plume)

Cornus canadensis

SOIL AND SITE

Equisetum pratense

	Moisture Regime:	subhygric
	Nutrient Regime:	medium - rich
*	Slope Gradient (%):	1-2
*	Slope Position:	upper terrace (level)
*	Parent Material:	fluvial
*	Soil Texture:	moderately fine to moderately coarse
	Site Index (m @ 100 yr):	Sw 22

DISTRIBUTION: common along major rivers

Sw - CURRANT - HORSETAIL (BWBSmw2/05)

INTERPRETATIONS

Logging:
- clearcut
- hardwood removal should be considered to facilitate chemical brushing and weeding

Site preparation:

Objective	Sw	- reduce debris; prepare (elevated) planting spots; minimize future brush competition; improve planter access; mix humus and mineral soil; increase soil temperature
	Ac	- prepare seedbed by exposing mineral soil
Mechanical	Sw	- mound; plow; winter ripper plow
	Ac	- scarify
Prescribed fire		- broadcast burn

Species choice:

Preferred	- Sw
Acceptable	- Ac

Reforestation:
- terrace 1 - manage for Ac or hybrid poplar (trial basis)
- terraces 2 & 3 - plant Sw
- erosion of terraces 2 & 3 by the river may remove any planted Sw before it reaches merchantable size; extent of erosion should be predicted and planting boundaries adjusted accordingly
- natural Sw regeneration can be expected if there has been recent flooding
- raw plant Sw if duff depth is less than 10 cm, as roots will be in contact with moist, well-decomposed H material; otherwise prepare site
- plant on elevated microsites

Brush hazard:
- high (speckled alder, prickly rose, high-bush cranberry, bluejoint, balsam poplar, paper birch); a conifer release program will probably be required

Concerns:
- flooding
- erosion
- windthrow on block edge

BWBSmw2/05 - $

$ Ac - ALDER - HORSETAIL

VEGETATION

balsam poplar

Tree Layer: 75% cover
Balsam poplar, white spruce

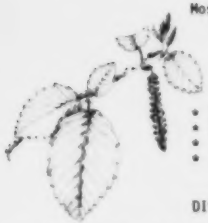
Shrub Layer: 50% cover

Cornus sericea	(red-osier dogwood)
Viburnum edule	(highbush-cranberry)
Alnus incana ssp. tenuifolia	(mountain alder)
Rosa acicularis	(prickly rose)
white spruce	

Herb Layer: 10% cover

Pyrola asarifolia	(pink wintergreen)
Equisetum pratense	(meadow horsetail)
Equisetum hyemale	(scouring-rush)
Rubus pubescens	(trailing raspberry)
Vicia americana	(American vetch)

Moss Layer: usually absent



Alnus incana ssp. tenuifolia

SOIL AND SITE

Moisture Regime:	subhygric - hygric
Nutrient Regime:	rich
* Slope Gradient (%):	0
* Slope Position:	middle terrace (level)
* Parent Material:	fluvial
* Soil Texture:	medium to moderately coarse

DISTRIBUTION: this association often occupies the middle and lower terraces of major river valleys

Equisetum pratense

S AC - ALDER - HORSETAIL (BWBSmw2/05-S)

INTERPRETATIONS

Logging:
- clearcut
- there is a large Sw understory associated with this association
- a conifer release program may aid in adding increment to the Sw, but it is more likely that the site will be clearcut and merchantable Sw harvested

Site preparation:

Objective
- Sw - reduce debris; prepare (elevated) planting spots; minimize future brush competition; improve planter access; mix humus and mineral soil; increase soil temperature
- Ac - prepare seedbed by exposing mineral soil

Mechanical
- Sw - mound; plow; winter ripper plow
- Ac - scarify

Prescribed fire
- broadcast burn

Species choice:

Preferred
Acceptable
- Sw, Ac

Brush hazard:
- high (speckled alder, prickly rose, high-bush cranberry, bluejoint, balsam poplar)

Reforestation:
- terrace 1 - manage for Ac or hybrid poplar (trial basis)
- terraces 2 & 3 - plant Sw, mixed wood management or manage for Ac
- erosion of terraces 2 & 3 by the river may remove any planted Sw before it reaches merchantable size; extent of erosion should be predicted and planting boundaries adjusted accordingly
- natural Sw regeneration can be expected if there has been recent flooding and there is an adjacent seed source
- raw plant Sw if duff depth is less than 10 cm or roots will be in contact with moist, well-decomposed H material; otherwise prepare site
- plant on elevated microsites

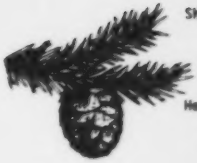
Concerns:
- flooding

BWBSmw2/06

Sb - FEATHERMOSS - BLUEBELLS

VEGETATION

Tree Layer: 50% cover
Black spruce, (tamarack)



black spruce

Shrub Layer: 35% cover

Rosa acicularis	(prickly rose)
Ledum groenlandicum	(Labrador tea)
Betula neoalaskana	(Alaska paper birch)

black spruce

Herb Layer: 40% cover

Equisetum sylvaticum	(wood horsetail)
Equisetum arvense	(common horsetail)
Cornus canadensis	(bunchberry)
Vaccinium vitis-idaea	(lingonberry)
Rubus chamaemorus	(cloudberry)
Orthilia secunda	(one-sided wintergreen)
Petasites palmatus	(palmate coltsfoot)

Moss Layer: 90% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Hylocomium splendens	(step moss)
Ptilium crista-castrensis	(knight's plume)
Sphagnum girgensohnii	
Aulacomnium palustre	(glow moss)
Philonotis fontana	
Pohlia nutans	

Ledum groenlandicum

SOIL AND SITE

	Moisture Regime:	subhygric - hygric
	Nutrient Regime:	medium - poor
*	Slope Gradient (%):	0-12
*	Slope Position:	lower
	Parent Material:	morainal, lacustrine, occasionally organic
*	Soil Texture:	fine to moderately fine; fibric (organic soil)

DISTRIBUTION: common

Equisetum sylvaticum

5B - FEATHERMOSS - BLUEBELLS (BWBSmw2/06)

INTERPRETATIONS

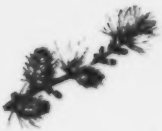
Management objectives: - non-commercial at this time

BWBSmw2/07

Lt - HORSETAIL

VEGETATION

Tree Layer: 65% cover
Black spruce, tamarack, white spruce



tamarack

Shrub Layer: 25% cover

Ledum groenlandicum	(Labrador tea)
Viburnum edule	(highbush-cranberry)
Rosa acicularis	(prickly rose)
Salix bebbiana	(Bebb's willow)
Alnus incana ssp. tenuifolia	(mountain alder)
Ribes triste	(red swamp currant)
black spruce	

Herb Layer: 75% cover

Equisetum arvense	(common horsetail)
Equisetum pratense	(meadow horsetail)
Equisetum sylvaticum	(wood horsetail)
Equisetum scirpoides	(dwarf scouring-rush)
Cornus canadensis	(bunchberry)
Mitella nuda	(common mitrewort)
Carex disperma	(soft-leaved sedge)
Vaccinium vitis-idaea	(lingonberry)
Smilacina trifolia	(three-leaved false Solomon's-seal)
Moneses uniflora	(single delight)
Orthilia secunda	(one-sided wintergreen)
Linnaea borealis	(twinflower)
Rubus pubescens	(trailing raspberry)
Mertensia paniculata	(tall bluebells)
Goodyera repens	(dwarf rattlesnake orchid)
Platanthera orbiculata	(round-leaved rein-orchid)
Calamagrostis canadensis	(bluejoint)

Ledum groenlandicum

Moss Layer: 80% cover

Hylocomium splendens	(step moss)
Ptilium crista-castrensis	(knight's plume)
Pleurozium schreberi	(red-stemmed feathermoss)
Aulacomnium palustre	(glow moss)

SOIL AND SITE

	Moisture Regime:	hygric (-subhydric)
	Nutrient Regime:	rich
*	Slope Gradient (%):	0-3
*	Slope Position:	level
	Parent Material:	morainal, fluvial, organic
*	Soil Texture:	medium to coarse

DISTRIBUTION: common

Equisetum arvense

LT - HORSETAIL (BWBSmw2/07)

INTERPRETATIONS

Management objectives: - non-commercial at this time

BWBSmw2/08

Sb - CLOUDBERRY - SPHAGNUM

black spruce

Rubus chamaemorus

Sphagnum fuscum

VEGETATION

Tree Layer: 0-20% cover
(Black spruce, tamarack)

Shrub Layer: 65% cover

Ledum groenlandicum	(Labrador tea)
Chamaedaphne calyculata	(leatherleaf)
black spruce	
tamarack	

Herb Layer: 25% cover

Vaccinium vitis-idaea	(lingonberry)
Rubus chamaemorus	(cloudberry)
Vaccinium microcarpum	(dwarf bog cranberry)
Drosera rotundifolia	(round-leaved sundew)
Andromeda polifolia	(bog-rosemary)

Moss Layer: 95% cover

Sphagnum fuscum	(common brown sphagnum)
Cladina spp.	
Pleurozium schreberi	(red-stemmed feathermoss)
Cladonia spp.	
Dicranum undulatum	
Icmadophila ericetorum	
Mylia anomala	
Peltigera canina	(dog lichen)

SOIL AND SITE

	Moisture Regime:	hygric - subhydric
	Nutrient Regime:	very poor - poor
*	Slope Gradient (%):	0
*	Slope Position:	level
*	Parent Material:	organic
	Soil Texture:	fibric

DISTRIBUTION: very common

SB - CLOUDBERRY - SPHAGNUM (BWBSmw2/08)

INTERPRETATIONS

Management objectives: - non-commercial at this time

BWBSmw2/09

Sb - WILLOW

VEGETATION

Tree Layer: very poorly developed
(Black spruce)

black spruce

Shrub Layer: 75% cover

Ledum groenlandicum	(Labrador tea)
Salix novae-angliae	(New England willow)
Salix arbusculoides	(northern bush willow)
Salix myrtillifolia	(bilberry willow)
black spruce	

Herb Layer: 65% cover

Vaccinium vitis-idaea	(lingonberry)
Equisetum scirpoides	(dwarf scouring-rush)
Equisetum arvense	(common horsetail)
Pedicularis labradorica	(Labrador lousewort)
Epilobium angustifolium	(fireweed)
Arctostaphylos rubra	(red bearberry)
Rubus pubescens	(trailing raspberry)
Mertensia paniculata	(tall bluebells)
Senecio lugens	(black-tipped groundsel)
Cornus canadensis	(bunchberry)
Vaccinium microcarpum	(dwarf bog cranberry)
Carex dioica	(yellow bog sedge)

Salix spp.

Moss Layer: 90% cover

Aulacomnium palustre	(glow moss)
Hylocomium splendens	(step moss)
Tomenthypnum nitens	(golden fuzzy fen moss)
Peltigera spp.	
Cladina spp.	

SOIL AND SITE

Moisture Regime:	hygric - subhydric
Nutrient Regime:	(poor -) medium
* Slope Gradient (%):	0
* Slope Position:	level
* Parent Material:	fluvial, organic/fluvial
Soil Texture:	variable

DISTRIBUTION: uncommon

Aulacomnium palustre

SB - WILLOW (BWBSmw2/09)

INTERPRETATIONS

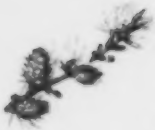
Management objectives: - non-commercial at this time

BWBSmw2/10

Lt - BUCKBEAN

VEGETATION

Tree Layer: 25% cover
Tamarack



Shrub Layer: 85% cover

Betula glandulosa	(scrub birch)
Chamaedaphne calyculata	(leatherleaf
Ledum groenlandicum	(Labrador tea)
Myrica gale	(sweet gale)
tamarack	
black spruce	

Herb Layer: 70% cover

Menyanthes trifoliata	(buckbean)
Vaccinium oxycoccus	(bog cranberry)
Pyrola asarifolia	(pink wintergreen)
Carex paupercula	(poor sedge)
Carex gigica	(yellow bog sedge)
Carex aquatilis	(water sedge)
Carex interior	(inland sedge)
Drosera rotundifolia	(round-leaved sundew)

tamarack

Moss Layer: 90% cover

Sphagnum capillaceum	(common red sphagnum)
Sphagnum recurvum	
Aulacomnium palustre	(glow moss)
Calliergon stramineum	
Calliergon giganteum	
Paludella squarrosa	
Drepanocladus revolvens	
Brvum pseudotriquetrum	
Meesia triquetra	
Tomenthypnum nitens	(golden fuzzy fen moss)

Menyanthes trifoliata

SOIL AND SITE

	Moisture Regime:	(hygric) - subhydric
	Nutrient Regime:	medium - rich
*	Slope Gradient (%):	0
*	Slope Position:	level
*	Parent Material:	organic
	Soil Texture:	mesic

DISTRIBUTION: common

Sphagnum capillaceum

LT - BUCKBEAN (BWBSmw2/10)

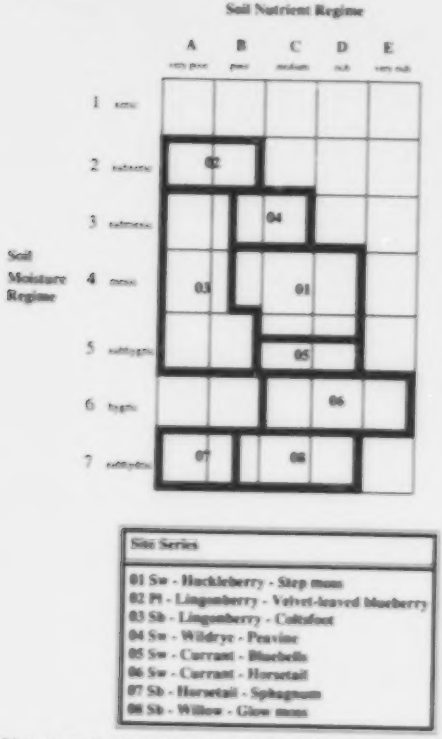
INTERPRETATIONS

Management objectives: - non-commercial at this time

NOTES

6 THE BWBSwk1 VARIANT

BWBSwk1 Murray BWBSwk



Site Series
01 Sw - Huckleberry - Step moss
02 Pl - Lingonberry - Velvet-leaved blueberry
03 Sb - Lingonberry - Coltsfoot
04 Sw - Wildrye - Peavine
05 Sw - Currant - Bluebells
06 Sw - Currant - Horsetail
07 Sb - Horsetail - Sphagnum
08 Sb - Willow - Glow moss

FIGURE 3. Edatopic grid displaying site series in the BWBSwk1 variant.

KEY TO SITE UNITS OF THE BWBSwk1

1a Canopy dominated by black spruce; toe of slope or depression

2a Usually organic soils; moss layer dominated by Sphagnum spp. (p. 63)[0]

BWBSwk1/07

2b Usually mineral soils; moss layer dominated by feather mosses

BWBSwk1/08

1b Black spruce, if present in canopy, with lodgepole pine; upper to lower slope or depression

3a White spruce in canopy

4a Mid to upper slope; Lonicera involucrata (p. 9) and Ribes lacustre (p. 11) rare or absent

BWBSwk1/01

4b Mid to lower slope or depression; Lonicera involucrata and Ribes lacustre common and often abundant

5a Viburnum edule (p. 15) and Pleurozium schreberi (p. 61) abundant, Equisetum spp (p. 24) low cover (<5%) or absent

BWBSwk1/05

5b Viburnum edule and Pleurozium schreberi rare or absent, Equisetum spp. high cover (>20%)

BWBSwk1/06

3b White spruce generally absent from canopy, canopy dominated by lodgepole pine or lodgepole pine - black spruce

6a Tree canopy sparse (<20% cover); lichens main ground cover

BWBSwk1/02

6b Tree canopy well developed (>30% cover); lichens low cover

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[0] Page numbers refer to the publication "Some Common Plants of the Sub-Boreal Spruce Zone" (Pojar et al. 1982).

7a Canopy of lodgepole pine only; Shepherdia canadensis (p. 13) abundant (>10%)

PiBSwA1/04

7b Canopy of lodgepole pine-black spruce; Shepherdia canadensis low cover (usually <5%) or absent

PiBSwA1/01

BWBSwk1/01

Sw - HUCKLEBERRY - STEP MOSS

VEGETATION

Tree Layer: 50% cover
Lodgepole pine, white spruce

Shrub Layer: 60% cover

Alnus viridis ssp. sinuata	(Sitka alder)
Vaccinium membranaceum	(black huckleberry)
Rosa acicularis	(prickly rose)
Spiraea betulifolia	(birch-leaved spirea)
subalpine fir	

Alnus viridis ssp. sinuata

Herb Layer: 35% cover

Cornus canadensis	(bunchberry)
Epilobium angustifolium	(fireweed)
Linnaea borealis	(twinflower)
Arnica cordifolia	(heart-leaved arnica)
Rubus pubescens	(trailing raspberry)
Pyrola asarifolia	(pink wintergreen)
Petasites palmatus	(palmate coltsfoot)
Lycopodium annotinum	(stiff clubmoss)
Calamagrostis canadensis	(bluejoint)
Orthilia secunda	(one-sided wintergreen)

V. membranaceum

Moss Layer: 60% cover

Pleurozium schreberi	(red-stemmed feathermoss)
[Ptilium crista-castrensis]	(knight's plume)]
[Hylocomium splendens	(step moss)]

SOIL AND SITE

Moisture Regime:	(submesic) - mesic
Nutrient Regime:	(poor) - medium - (rich)
Slope Gradient (%):	0-67, usually less than 20
* Slope Position:	upper to mid
* Parent Material:	morainal,(glacio)fluvial
Soil Texture:	variable
Coarse Fragments (%):	0-35

DISTRIBUTION: common

Hylocomium splendens

SW - HUCKLEBERRY - STEP MOSS (BWBSwk1/01)

INTERPRETATIONS

Logging:
- clearcut
- harvest fine-textured moraines when soils dry or frozen
- trafficability may be a problem if long durations of heavy rainfall occurs

Site preparation:

Objective
- promote natural regeneration; prepare planting spots; improve planter access; increase soil temperature; reduce heavy slash; minimize future brush competition

Mechanical
- drag scarify*; patch scarify; mix humus with mineral

Prescribed fire
- pile and burn

Species choice:

Preferred
- Sw

Acceptable
- Pl

Brush hazard:
- moderate (Sitka alder, bluejoint)
- brush competition will likely occur within 3 years of harvesting; sites should be inspected at 3 years to determine if any further treatment is required

Reforestation:
- conduct a Pl cone survey to determine seed adequacy for establishing a natural Pl stand. If seed supply is adequate, mechanically treat the site. If seed is insufficient, plant Pl or Sw stock.
- plant as soon as the frost is out of the ground
- thinning of over-dense Pl may be required

Concerns:

BWBSwk1/02

P1 - LINGONBERRY - VELVET-LEAVED BLUEBERRY

VEGETATION

Tree Layer: 15% cover
Lodgepole pine, (black spruce)

lodgepole pine

Shrub Layer: 25% cover
Vaccinium myrtilloides (velvet-leaved blueberry)
black spruce

Herb Layer: 10% cover
Lycopodium complanatum (ground cedar)
Arctostaphylos uva-ursi (kinnikinnick)
Vaccinium vitis-idaea (lingonberry)

Moss Layer: 85% cover
Cladina rangiferina (reindeer lichen)
Peltigera spp.

SOIL AND SITE

	Moisture Regime:	subxeric
	Nutrient Regime:	(very poor) - poor
•	Slope Gradient (%):	0-2
•	Slope Position:	level
	Parent Material:	glaciofluvial
•	Soil Texture:	medium (to coarse)
	Coarse Fragments (%):	55

COMMENTS: Based on very limited data.

DISTRIBUTION: rare

Vaccinium myrtilloides

Lycopodium complanatum

Pl - LINGONBERRY - VELVET-LEAVED BLUEBERRY (BWBSwk1/02)

INTERPRETATIONS

Logging:	- clearcut - full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensured if managing for naturals
Site preparation:	
Objective	- promote natural regeneration; prepare planting spots; improve planter access; improve moisture status
Mechanical	- drag scarify*; disc trench
Prescribed fire	- do not burn
Species choice:	
Preferred Acceptable	- Pl
Brush hazard:	- low
Reforestation:	- conduct a Pl cone survey to determine seed adequacy for establishing a natural Pl stand. Plant Pl if necessary, but expect heavy mortality due to droughty conditions.
Concerns:	- severe drought period - mistletoe - expect stocking levels to take 10 years to achieve - because these sites are marginal for timber production, large silvicultural investment may be difficult to justify, and management must ensure that productivity is not further reduced

BWBSwk1/03

Sb - LINGONBERRY - COLTSFOOT

VEGETATION

Tree Layer: 45% cover
Lodgepole pine, (black spruce)

black spruce

Shrub Layer: 85% cover

Ledum groenlandicum	(Labrador tea)
Vaccinium myrtilloides	(velvet-leaved blueberry)
Rosa acicularis	(prickly rose)
Vaccinium membranaceum	(black huckleberry)
[Shepherdia canadensis	(soopolallie)]

black spruce

Herb Layer: 25% cover

Cornus canadensis	(bunchberry)
Linnaea borealis	(twinflower)
Vaccinium vitis-idaea	(lingonberry)
Petasites palmatus	(palmate coltsfoot)
Epilobium angustifolium	(fireweed)
Arnica cordifolia	(heart-leaved arnica)
Lycopodium annotinum	(stiff clubmoss)

Moss Layer: 40% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Peltigera aphthosa	

Ledum groenlandicum

SOIL AND SITE

Moisture Regime:	submesic - subhygric
Nutrient Regime:	(very poor) - poor
* Aspect:	generally northerly facing
* Slope Gradient (%):	0-40; generally less than 15
Slope Position:	upper - (lower)
Parent Material:	variable
Soil Texture:	moderately fine to coarse
Coarse Fragments (%):	0-17

DISTRIBUTION: very common

Vaccinium myrtilloides

SB - LINGONBERRY - COLTSFOOT (BWBSwk1/03)

INTERPRETATIONS

Logging:

- clearcut
- full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensured if managing for naturals

Site preparation:

Objective	- promote natural regeneration; prepare planting spots; improve planter access
Mechanical	- drag scarify*; disc trench; patch scarify; mix humus with mineral
Prescribed fire	- do not burn

Species choice:

Preferred Acceptable	- Pl

Brush hazard:

- low

Reforestation:

- conduct a Pl cone survey to determine seed adequacy for establishing a natural Pl stand. If cone survey results indicate little seed, then plant Pl.

Concerns:

- mistletoe
- expect 10 years to achieve stocking
- moisture deficits will usually occur during the growing season on these sites
- because these sites are marginal for timber production, silvicultural investment may be difficult to justify, and management must ensure that productivity is not further reduced

BWBSwk1/04

Sw - WILDRYE - PEAVINE

VEGETATION

S. canadensis

Tree Layer: 45% cover
Lodgepole pine

Shrub Layer: 40% cover

Shepherdia canadensis	(soopolallie)
Rosa acicularis	(prickly rose)
Ledum groenlandicum	(Labrador tea)
Spiraea betulifolia	(birch-leaved spirea)
Salix spp.	(willows)

Herb Layer: 60% cover

Linnaea borealis	(twinflower)
Aster conspicuus	(showy aster)
Arnica cordifolia	(heart-leaved arnica)
Epilobium angustifolium	(fireweed)
Lathyrus ochroleucus	(creamy peavine)
Cornus canadensis	(bunchberry)
[Calamagrostis canadensis	(bluejoint)]
[Elymus innovatus	(fuzzy-spiked wildrye)]

Moss Layer: 15% cover

Pleurozium schreberi	(red-stemmed feathermoss)

Elymus innovatus

SOIL AND SITE

Moisture Regime:	submesic - mesic
Nutrient Regime:	(poor) - medium
• Aspect:	often southerly facing
Slope Gradient (%):	9-40
• Slope Position:	mid - upper
Parent Material:	morainal, (glacio)fluvial
Soil Texture:	fine to coarse
Coarse Fragments (%):	7-49

DISTRIBUTION: uncommon

Lathyrus ochroleucus

SW - WILDRYE - PEAVINE (BWBSwk1/04)

INTERPRETATIONS

Logging:

- clearcut
- full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensured if you are managing for naturals

Site preparation:

Objective
- promote natural regeneration; prepare planting spots; improve planter access

Mechanical
- drag scarify*; disc trench; patch scarify; mix humus with mineral
- light drag scarify if logged in winter and cone crop survey indicates a good supply of seeds

Prescribed fire
- do not burn

Species choice:

Preferred
Acceptable
- Pl

Brush hazard:
- low

Reforestation:
- conduct a Pl cone survey to determine seed adequacy for establishing a natural Pl stand. If cones are insufficient, Pl stock could be planted without site preparation.
- thinning of over-dense Pl may be required

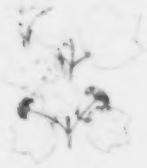
Concerns:
- moisture deficits will usually occur during the growing season on these sites.

BWBSwk1/05

Sw - CURRANT - BLUEBELLS

VEGETATION

Tree Layer: 45% cover
White spruce, (balsam poplar)



Viburnum edule

Shrub Layer: 45% cover

Viburnum edule	(highbush-cranberry)
Lonicera involucrata	(black twinberry)
Ribes lacustre	(black gooseberry)
Rosa acicularis	(prickly rose)
Ribes triste	(red swamp currant)

Herb Layer: 55% cover

Linnaea borealis	(twinflower)
Rubus pubescens	(trailing raspberry)
Epilobium angustifolium	(fireweed)
Petasites palmatus	(palmate coltsfoot)
Mertensia paniculata	(tall bluebells)
Mitella nuda	(common mitrewort)
Osmorhiza chilensis	(sweet cicely)
Cornus canadensis	(bunchberry)
Actaea rubra	(baneberry)
Fragaria virginiana	(wild strawberry)
Heracleum sphondylium	(cow-parsnip)
Arnica cordifolia	(heart-leaved arnica)
Delphinium glaucum	(tall larkspur)
Galium triflorum	(sweet-scented bedstraw)
Equisetum pratense	(meadow horsetail)
Corallorhiza trifida	(yellow coralroot)

Ribes triste

Moss Layer: 40% cover

Pleurozium schreberi	(red-stemmed feathermoss)
[Hylocomium splendens	(step moss)]

SOIL AND SITE

Mertensia paniculata

	Moisture Regime:	subhygric
	Nutrient Regime:	medium - rich
*	Slope Gradient (%):	5-18
*	Slope Position:	mid - lower
	Parent Material:	morainal, colluvial
	Soil Texture:	moderately coarse to moderately fine
	Coarse Fragments (%):	1-20

COMMENTS: Devil's club and oakfern can be abundant, especially on north-facing slopes.

DISTRIBUTION: uncommon

SW - CURRANT - BLUEBELLS (BWBSwk1/05)

INTERPRETATIONS

Logging:	- clearcut - trafficability will be a problem on these sites when soils are not frozen
Site preparation:	
Objective	- reduce organic layers; reduce debris; prepare planting spots; increase soil temperature; improve planter access; minimize future brush competition
Mechanical	- mix humus with mineral soil, mound, plow
Prescribed fire	- pile and burn, broadcast burn*
Species choice:	
Preferred Acceptable	- Sw
Brush hazard:	- moderate (fireweed, Sitka alder, bluejoint) - moderate brush competition will likely occur within 3 years of harvesting; sites should be inspected at 3 years to determine if any further treatment is required
Reforestation:	- use large planting stock
Concerns:	- perched water table - windthrow

BWBSwk1/06

Sw - CURRANT - HORSETAIL

L. involucrata

Ribes lacustre

Equisetum pratense

VEGETATION

Tree Layer: 45% cover
White spruce, (trembling aspen)

Shrub Layer: 10% cover

Lonicera involucrata	(black twinberry)
Ribes lacustre	(black gooseberry)
Rosa acicularis	(prickly rose)
Ribes triste	(red swamp currant)

Herb Layer: 75% cover

Rubus pubescens	(trailing raspberry)
Heracleum sphondylium	(cow-parsnip)
Mertensia paniculata	(tall bluebells)
Osmorhiza chilensis	(sweet cicely)
Mitella nuda	(common mitrewort)
Delphinium glaucum	(tall larkspur)
Equisetum pratense	(meadow horsetail)
Equisetum arvense	(common horsetail)
Cornus canadensis	(bunchberry)
Linnaea borealis	(twinflower)
Fragaria virginiana	(wild strawberry)
Petasites palmatus	(palmate coltsfoot)
Actaea rubra	(baneberry)
Moneses uniflora	(single delight)

Moss Layer: 15% cover

Hylocomium splendens	(step moss)
Mnium spp.	(leafy mosses)

SOIL AND SITE

Moisture Regime:	subhygric - hygric
Nutrient Regime:	medium - rich
Slope Gradient (%):	5-25
* Slope Position:	mid - depression
Parent Material:	morainal, lacustrine, fluvial
* Soil Texture:	medium to moderately fine
Coarse Fragments (%):	0-18

DISTRIBUTION: uncommon

SW - CURRANT - HORSETAIL (BWBSwk1/06)

INTERPRETATIONS

Logging:	- clearcut - trafficability will be a problem on these sites when soils are not frozen
Site preparation:	
Objective	- reduce organic layers; reduce debris; prepare raised planting spots; increase soil temperature; improve planter access; minimize future brush competition
Mechanical	- mound or plow
Prescribed fire	- broadcast burn
Species choice:	
Preferred Acceptable	- Sw
Brush hazard:	- very high (black twinberry, fireweed) - brush competition will require post-planting inspections of harvested sites to determine the need for vegetation control
Reforestation:	- plant as soon as frost is out of the ground - use large planting stock
Concerns:	- windthrow - root rot - compaction - perched water table - this association is critical to the control of runoff and stream flow - water table will likely rise above the ground surface in the spring causing seedling mortality - herbicide use to control brush competition may conflict with wildlife needs

BWBSwk1/07

Sb - HORSETAIL - SPHAGNUM

VEGETATION

Tree Layer: 35% cover
Black spruce

Shrub Layer: 20% cover

Ledum groenlandicum	(Labrador tea)
Salix spp.	(willows)

Herb Layer: 40% cover

Carex spp.	(sedges)
Vaccinium vitis-idaea	(lingonberry)
Vaccinium oxycoccus	(bog cranberry)
Equisetum spp.	(horsetails)
Smilacina trifolia	(three-leaved false Solomon's-seal)
Petasites palmatus	(palmate coltsfoot)
Listera cordata	(heart-leaved twayblade)
Mitella nuda	(common mitrewort)
Platanthera obtusata	(one-leaved rein-orchid)

black spruce

Moss Layer: 85% cover

Hylocomium splendens	(step moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Aulacomnium palustre	(glow moss)
Sphagnum spp.	(sphagnum mosses)
Mnium spp.	(leafy mosses)
Peltigera spp.	

Equisetum arvense

SOIL AND SITE

Moisture Regime:	subhydric
Nutrient Regime:	very poor - poor
Slope Gradient (%):	0-2
* Slope Position:	toe - depression
* Parent Material:	organic, lacustrine
* Soil Texture:	mesic to fibric (organic soil) fine (mineral soils)
Coarse Fragments (%):	0

DISTRIBUTION: common

Sphagnum spp.

SB - HORSETAIL - SPHAGNUM (BWBSwk1/07)

INTERPRETATIONS

Management objectives: - non-commercial at this time

BWBSwk1/08

Sb - WILLOW - GLOW MOSS

VEGETATION

Tree Layer: 35% cover
Black spruce

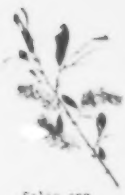
Shrub Layer: 15% cover

Salix spp.	(willows)
Ledum groenlandicum	(Labrador tea)
Betula glandulosa	(scrub birch)

black spruce

Herb Layer: 50% cover

Carex spp.	(sedges)
Linnaea borealis	(twinflower)
Equisetum scirpoides	(dwarf scouring rush)
Equisetum pratense	(meadow horsetail)
Equisetum arvense	(common horsetail)
Mitella nuda	(common mitrewort)
Cornus canadensis	(bunchberry)
Vaccinium vitis-idaea	(lingonberry)
Listera cordata	(heart-leaved twayblade)
Mertensia paniculata	(tall bluebells)
Petasites palmatus	(palmate coltsfoot)
Achillea millefolium	(yarrow)



Salix spp.

Moss Layer: 80% cover

Hylocomium splendens	(step moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Aulacomnium palustre	(glow moss)
Sphagnum spp.	(sphagnum moss)
Mnium spp.	(leafy mosses)
Peltigera spp.	

SOIL AND SITE

Moisture Regime:	(hygric -) subhydric
Nutrient Regime:	(poor) - rich
Slope Gradient (%):	0-14
* Slope Position:	toe - depression
* Parent Material:	organic, occasionally fluvial or morainal
* Soil Texture:	organic, or moderately fine mineral soil
* Coarse Fragments (%):	0-8

DISTRIBUTION:

Equisetum scirpoides

SB - WILLOW - GLOW MOSS (BWBSwk1/08)

INTERPRETATIONS

Management objectives - non commercial at this time

NOTES

7 THE BWBSwk2 VARIANT

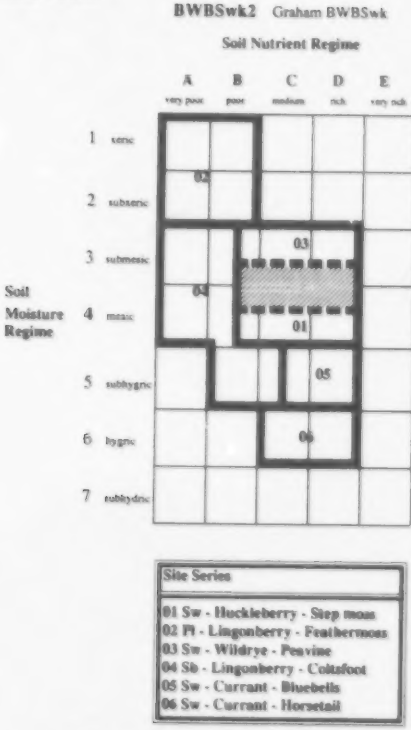


FIGURE 5. Edatopic grid displaying site series in the BWBSwk2 variant.

KEY TO SITE UNITS OF THE BWBSwk2

1a Canopy dominated by black spruce alone; toe of slope or depression

Bog Ecosystems

1b Black spruce, if present in canopy, with lodgepole pine; upper to lower slope or depression

2a Black spruce moderate cover (>5%) in either tree or shrub layer

3a Slope gradient usually <5%; aspect usually north or flat; Ledum groenlandicum (p. 9)[9] and Vaccinium vitis-idaea (lingonberry) generally moderate cover (>5%)

BWBSwk2/04

3b Slope gradient usually >5%; aspect variable; Ledum groenlandicum (p. 9) and Vaccinium vitis-idaea (lingonberry) generally low cover (<5%) or absent

BWBSwk2/01

2b Black spruce low cover (<1%) or absent

4a Soils very coarse; herb layer very poorly developed (<10% cover); moderate cover (>5%) of lichens

BWBSwk2/02

4b Soils variable; herb layer well developed (>30% cover); lichens low cover (<5%) or absent

5a Often upper slope but if not, then soil is coarse textured; aspect generally southerly; Shepherdia canadensis (p. 13) and Elymus innovatus (fuzzy-spiked wildrye) usually moderate cover (>10%)

BWBSwk2/03

5b Usually not upper slope but if so then soil fine textured; aspect variable; Shepherdia canadensis and Elymus innovatus low cover (<5%) or absent

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9 Page numbers refer to the publication "Some Common Plants of the Sub-Boreal Spruce Zone" (Pojar et al. 1982).

6a Usually mid to upper slope; if lower slope or level then not receiving seepage; Vaccinium membranaceum (p. 14) moderate cover (>5%)

BWBSwk2/01

6b Usually lower slope to toe, if not then receiving seepage; Vaccinium membranaceum low cover (<5%) or absent

7a Water table often within 50 cm of surface; Equisetum arvense (p. 24) high cover (>10%)

BWBSwk2/06

7b Water usually not within 50 cm of surface; Equisetum arvense low cover (<5%) or absent

BWBSwk2/05

BWBSwk2/01

Sw - HUCKLEBERRY - STEP MOSS

VEGETATION

Tree Layer: 35% cover
White spruce, lodgepole pine

V. membranaceum

Shrub Layer: 35% cover
Vaccinium membranaceum (black huckleberry)
Rosa acicularis (prickly rose)
(Alnus viridis ssp. sinuata (Sitka alder)]
subalpine fir

Herb Layer: 35% cover
Cornus canadensis (bunchberry)
Linnaea borealis (twinflower)
Orthilia secunda (one-sided wintergreen)
Epilobium angustifolium (fireweed)
Lycopodium annotinum (stiff clubmoss)
Vaccinium vitis-idaea (lingonberry)
Petasites palmatus (palmate coltsfoot)

Cornus canadensis

Moss Layer: 80% cover
Pleurozium schreberi (red-stemmed feathermoss)
Hylocomium splendens (step moss)
Ptilium crista-castrensis (knight's plume)
Peltigera aphthosa

SOIL AND SITE

Moisture Regime:	submesic - mesic
Nutrient Regime:	(poor -) medium (- rich)
Slope Gradient (%):	0-60, usually less than 25
* Slope Position:	upper to lower, usually mid
Parent Material:	variable but usually morainal
* Soil Texture:	medium - coarse
Coarse Fragments (%):	0-75
Site Index:	Pl 20 (17-27) Sw 21 (20-27)

Hylocomium splendens

DISTRIBUTION: very common

SW - HUCKLEBERRY - STEP MOSS (BWBSwk2/01)

INTERPRETATIONS

Logging:	- clearcut - full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensured if you are managing for naturals - trafficability may be a problem if long durations of rainfall occur
Site preparation:	
Objective	- promote natural regeneration; prepare planting spots; improve planter access; increase soil temperature; reduce heavy slash; minimize future brush competition
Mechanical	- drag scarify*; patch scarify; mix humus with mineral
Prescribed fire	- pile and burn
Species choice:	
Preferred Acceptable	- Pl, Sw
Brush hazard:	- moderate (Sitka alder, bluejoint) - moderate brush competition may occur within 3 years of harvesting; sites should be inspected at 3 years to determine further treatment
Reforestation:	- conduct a Pl cone survey to determine seed adequacy for establishing a natural Pl stand. If seed is insufficient, plant Pl or Sw stock. - plant as soon as the frost is out of the ground
Concerns:	- possible alder competition problem - moderate grass competition at lower elevations

BWBSwk2/02

P1 - LINGONBERRY - FEATHERMOSS

VEGETATION

Tree Layer: 30% cover
Lodgepole pine, (subalpine fir)

lodgepole pine

Shrub Layer: 20% cover

Alnus viridis ssp. sinuata	(Sitka alder)
Juniperus communis	(common juniper)
Shepherdia canadesis	(soopolallie)
subalpine fir	

Herb Layer: 5% cover

Vaccinium caespitosum	(dwarf huckleberry)
Epilobium angustifolium	(fireweed)
Pyrola chlorantha	(green wintergreen)
Vaccinium vitis-idaea	(lingonberry)
[Arctostaphylos uva-ursi	(kinnikinnick)]

Moss Layer: 50% cover

Dicranum fuscescens	(curly heron's-bill moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Hylocomium splendens	(step moss)
Peltigera spp.	
Cladina spp.	

Alnus viridis ssp. sinuata

SOIL AND SITE

	Moisture Regime:	(xeric) - subxeric
	Nutrient Regime:	very poor - poor
	Slope Gradient (%):	0-60
*	Slope Position:	upper to crest or level
	Parent Material:	glaciofluvial or colluvium over rock
*	Soil Texture:	coarse
	Coarse Fragments (%):	50-85
	Site Index:	P1 17

Juniperus communis

COMMENTS: Based on very limited data.

DISTRIBUTION: rare

Pl - LINGONBERRY - FEATHERMOSS (BWBSwk2/02)

INTERPRETATIONS

Logging:	- clearcut - full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensured if managing for naturals
Site preparation:	
Objective	- promote natural regeneration; prepare planting spots; improve planter access; improve moisture status
Mechanical	- drag scarify*; disc trench
Prescribed fire	- do not burn
Species choice:	
Preferred Acceptable	- Pl
Brush hazard:	- low
Reforestation:	- conduct a Pl cone survey to determine seed adequacy for establishing a natural Pl stand. If cone survey results indicate little seed, then plant Pl, but expect heavy mortality due to droughty conditions.
Concerns:	- severe drought period - mistletoe - expect 10 years to achieve stocking - because these sites are marginal for timber production, silvicultural investment may be difficult to justify, and management must ensure that productivity is not further reduced

BWBSwk2/03

Sw - WILDRYE - PEAVINE

VEGETATION

S. canadensis

Tree Layer: 30% cover
White spruce, lodgepole pine

Shrub Layer: 20% cover

Shepherdia canadensis	(soopolallie)
Rosa acicularis	(prickly rose)
[Viburnum edule	(highbush-cranberry)]

Herb Layer: 45% cover

Elymus innovatus	(fuzzy-spiked wildrye)
Epilobium angustifolium	(fireweed)
Linnaea borealis	(twinflower)
Mertensia paniculata	(tall bluebells)
Orthilia secunda	(one-sided wintergreen)
Cornus canadensis	(bunchberry)
Lathyrus ochroleucus	(creamy peavine)
Moneses uniflora	(single delight)

Elymus innovatus

Moss Layer: 80% cover

Hylocomium splendens	(step moss)
Pleurozium schreberi	(red-stemmed feathermoss)
Peltigera aphthosa	
Ptilium crista-castrensis	(knight's plume)

SOIL AND SITE

Moisture Regime:	submesic - mesic
Nutrient Regime:	(poor -) medium (- rich)
Slope Gradient (%):	5-60
* Slope Position:	mid to upper
Parent Material:	(glacio)fluvial, morainal or lacustrine over bedrock
Soil Texture:	fine - coarse
Coarse Fragments (%):	0-53
Site Index:	Pl 21 (17-26) Sw 20 (17-23)

DISTRIBUTION: common

Lathyrus ochroleucus

SW - WILDRYE - PEAVINE (BmGs-Ad2/03)

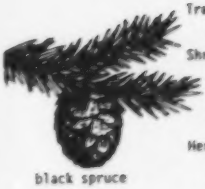
INTERPRETATIONS

Logging:	- clearcut - full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensure if managing for naturals
Site preparation:	
Objective	- promote natural regeneration; prepare planting spots; improve planter access; improve moisture status
Mechanical	- drag scarify*; disc trench
Prescribed fire	- do not burn
Species choice:	
Preferred Acceptable	- Pl
Brush hazard:	- low
Reforestation:	- conduct a Pl cone survey to determine seed adequacy for establishing a natural Pl stand. If cones are insufficient, plant Pl stock without site preparation. - drag scarification may be unnecessary if logged in summer and if cone crop survey indicates adequate seed
Concerns:	- drought - moisture deficits will usually occur during the growing season on these sites

BWBSwk2/04

Sb - LINGONBERRY - COLTSFOOT

VEGETATION



black spruce

Tree Layer: 30% cover
Lodgepole pine, (black spruce)

Shrub Layer: 40% cover

Ledum groenlandicum	(Labrador tea)
Rosa acicularis	(prickly rose)
Alnus viridis ssp. sinuata	(Sitka alder)
black spruce	

Herb Layer: 35% cover

Vaccinium vitis-idaea	(lingonberry)
Cornus canadensis	(bunchberry)
Linnaea borealis	(twinflower)
Petasites palmatus	(palmate coltsfoot)
Empetrum nigrum	(crowberry)
Epilobium angustifolium	(fireweed)

Moss Layer: 90% cover

Hylocomium splendens	(step moss)
Peltigera aphthosa	
Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Cladina spp.	

Ledum groenlandicum

SOIL AND SITE

Moisture Regime:	submesic - subhygric
Nutrient Regime:	(very poor -) poor
* Slope Gradient (%):	0-20
* Aspect:	usually north if sloping
Slope Position:	variable
Parent Material:	variable
Soil Texture:	fine to coarse
Coarse Fragments (%):	0-75 usually less than 10
Site Index:	Pl 17 (15-24)
	Sw 17 (14-22)

DISTRIBUTION: common

Vaccinium vitis-idaea

SB - LINGONBERRY - COLTSFOOT (BwBSwk2/04)

INTERPRETATIONS

Logging:
- clearcut
- full tree harvesting may seriously reduce cones on a site; good cone distribution must be ensured if managing for naturals

Site preparation:

Objective - promote natural regeneration; prepare planting spots; improve planter access

Mechanical - drag scarify; disc trench; patch scarify; mix humus with mineral

Prescribed fire - do not burn

Species choice:

Preferred
Acceptable - Pl

Brush hazard: - low

Reforestation:
- conduct a Pl cone survey to determine seed adequacy for establishing a natural Pl stand. If cone survey results indicate little seed, then plant Pl, but expect mortality due to droughty conditions.

Concerns:
- may be high water table in spring
- expect period of drought during growing season
- mistletoe
- expect stocking levels to take 10 years to achieve
- because some of these sites are marginal for timber production, large silvicultural investment may be difficult to justify, and management must ensure that productivity is not further reduced

BWBSwk2/05

Sw - CURRANT - BLUEBELLS

VEGETATION

Tree Layer: 40% cover
White spruce, (balsam poplar)

Ribes lacustre

Shrub Layer: 25% cover

Ribes lacustre	(black gooseberry)
Viburnum edule	(highbush-cranberry)
Ribes triste	(red swamp currant)
Rosa acicularis	(prickly rose)
Alnus viridis ssp. *sinuata*	(Sitka alder)
Sorbus scopulina	(western mountain-ash)
(*Oplopanax horridus*)	(devil's club)
subalpine fir	

Ribes triste

Herb Layer: 75% cover

Cornus canadensis	(bunchberry)
Mitella nuda	(common mitrewort)
Mertensia paniculata	(tall bluebells)
Petasites palmatus	(palmate coltsfoot)
Epilobium angustifolium	(fireweed)
Linnaea borealis	(twinflower)
Rubus pubescens	(trailing raspberry)
Orthilia secunda	(one-sided wintergreen)
Arnica cordifolia	(heart-leaved arnica)
Moneses uniflora	(single delight)
Equisetum scirpoides	(dwarf scouring-rush)
Equisetum arvense	(common horsetail)
Heracleum sphondylium	(cow-parsnip)
Elymus innovatus	(fuzzy-spiked wildrye)
Galium triflorum	(sweet-scented bedstraw)
[*Gymnocarpium dryopteris*	(oak fern)]

Moss Layer: 40% cover

Pleurozium schreberi	(red-stemmed feathermoss)
Ptilium crista-castrensis	(knight's plume)
Hylocomium splendens	(step moss)

Mertensia paniculata

SOIL AND SITE

Moisture Regime:	(mesic -) subhygric
Nutrient Regime:	medium - rich
* Slope Gradient (%):	5-20
* Slope Position:	mid to toe
Parent Material:	morainal, (glacio)fluvial
Soil Texture:	moderately coarse to fine
Coarse Fragments (%):	0-60
Site Index:	Sw 22

COMMENTS: Devil's club and oakfern can be abundant especially on north-facing slopes.

DISTRIBUTION: uncommon

Sw - CURRANT - BLUEBELLS (BWBSwk2/05)

INTERPRETATIONS

Logging:

- clearcut
- trafficability will be a problem on these sites when ground is not not frozen

Site preparation:

Objective	- reduce organic layers; reduce debris; prepare planting spots; increase soil temperature; improve planter access; minimize future brush competition
Mechanical	- mix humus with mineral soil, mound, plow
Prescribed fire	- pile and burn, broadcast burn*

Species choice:

Preferred Acceptable	- Sw

Brush hazard:

- moderate (fireweed, trembling aspen, Sitka alder, bluejoint)
- brush competition will likely occur within 3 years of harvesting; sites should be inspected at 3 years to determine further treatment
- hack-and-squirt aspen if it is expected to be a brush problem before the site is harvested; then fall the aspen during logging

Reforestation:

- use large planting stock

Concerns:

- perched water table
- windthrow

BWBSwk2/06

Sw - CURRANT - HORSETAIL

VEGETATION

Ribes triste

Tree Layer: 30% cover
white spruce

Shrub Layer: 30% cover
Ribes triste (red swamp currant)
Ribes lacustre (black gooseberry)
Rosa acicularis (prickly rose)
Shepherdia canadensis (soopolallie)
white spruce

Herb Layer: 70% cover
Equisetum arvense (common horsetail)
Equisetum pratense (meadow horsetail)
Mertensia paniculata (tall bluebells)
Linnaea borealis (twinflower)
Mitella nuda (common mitrewort)
Petasites palmatus (palmate coltsfoot)
Epilobium angustifolium (fireweed)
Elymus innovatus (fuzzy-spiked wildrye)
Equisetum scirpoides (dwarf scouring-rush)
Cornus canadensis (bunchberry)
Orthilia secunda (one-sided wintergreen)
Moneses uniflora (single delight)
Delphinium glaucum (tall larkspur)

Ribes lacustre

Moss Layer: 80% cover
Hylocomium splendens (step moss)
Pleurozium schreberi (red-stemmed feathermoss)
Ptilium crista-castrensis (knight's plume)
Mnium spp. (leafy mosses)

SOIL AND SITE

Equisetum arvense

Moisture Regime:	subhygric - hygric
Nutrient Regime:	medium - rich
• Slope Gradient (%):	0-25 (usually less than 15)
• Slope Position:	mid to toe or depression
• Parent Material:	variable, usually fluvial
Soil Texture:	coarse to moderately fine (usually medium)
Coarse Fragments (%):	0-70
Site Index:	Sw 23 (21-24)

DISTRIBUTION: uncommon

Sw - CURRANT - HORSETAIL (BWBSwk2/06)

INTERPRETATIONS

Logging:

- clearcut
- trafficability will be a problem on these sites during the summer

Site preparation:

Objective
- reduce organic layers; reduce debris; prepare raised planting spots; increase soil temperature; improve planter access; minimize future brush competition

Mechanical
- mound*

Prescribed fire
- broadcast burn

Species choice:

Preferred
Acceptable
- Sw, Pl

Brush hazard:

- very high (bluejoint, fireweed, willows)
- brush competition will require post-planting inspections of harvested sites to determine need for vegetation control

Reforestation:

- use large planting stock

Concerns:

- root rot (if managing for Sw)
- compaction
- windthrow
- this association is critical to the control of runoff and stream flow
- water table will likely rise above the ground surface in the spring, causing seedling mortality
- herbicide use to control brush competition may conflict with wildlife needs

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APPENDIX 1. Meso slope position diagram

a. Crest - the generally convex uppermost portion of a hill (meso scale), it is usually convex in all directions, no distinct aspect.

b. Upper Slope - the generally convex upper portion of the slope of a hill (meso scale) immediately below the crest, it has a convex surface profile with a specific aspect.

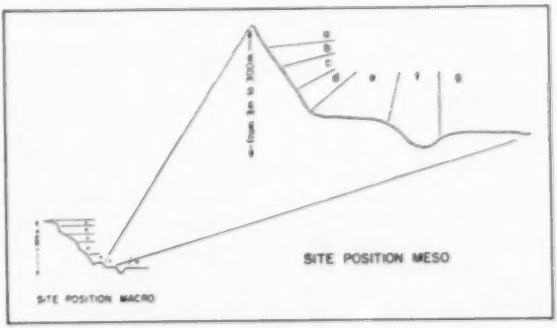
c. Middle Slope - the area of the slope of a hill between the upper slope and the lower slope, where the slope profile is not generally concave or convex, it has a straight or somewhat sigmoid surface profile with a specific aspect.

d. Lower Slope - the area toward the base of the slope of the hill. It generally has a concave surface profile with a specific aspect.

e. Toe - area defined by extent of homogeneous site of slight slope, clearly demarcated by an abrupt decrease in the slope (below and adjacent to the lower slope).

f. Depression - any area that is concave in all directions, generally at the foot of a meso scale hill or in generally level area.

g. Level - any level meso scale area not adjacent to a meso scale hill. The surface profile is generally horizontal with no significant aspect.



APPENDIX 2. Hand texturing field guide

Soil texture refers to the relative proportions of the sand, silt, and clay separates within a soil. These separates have their own distinctive properties of "feel", allowing one to estimate their proportions in a sample of soil by hand texturing. Texture can be estimated very roughly from a dry sample. Clayey materials are very hard, loamy and silty materials are slightly hard to soft, and sandy materials are loose grained. To be more precise, hand texturing should be done using the wet sample procedure given below.

Step 1

Obtain a small handful of soil, crush it in the hand, and remove coarse fragments (particles greater than 2 mm in diameter).

Step 2

Gradually add water to the soil and work it into a moist putty with a soil knife or fingers. The correct moisture content is important. If the putty flows with the force of gravity, then it is too wet. If it crumbles when rolled, then it is too dry. It should have the consistency of a filler putty.

Step 3

Determine stickiness of the soil putty by working it between the thumb and forefinger, pressing and then separating the fingers. An estimate of clay content can be made in this way. (Clay limits below are approximate.)

NONSTICKY: practically no soil material adheres to the thumb and forefinger (less than 10% clay).

SLIGHTLY STICKY: soil material adheres only to one of the fingers and comes off the other rather cleanly. The soil does not stretch appreciably when fingers are separated (less than 25% clay).

STICKY: soil material adheres to both fingers and stretches slightly before breaking when fingers are pulled apart (25-40% clay).

VERY STICKY: soil putty adheres strongly to both fingers and stretches distinctly before breaking (greater than 40% clay).

Step 4

Determine the grittiness of the soil putty by rubbing it between thumb and forefinger. An estimate of sand content can be made in this way. (Sand limits below are approximate.)

NON GRITTY: Little or no grit can be felt (less than 20% sand).

SLIGHTLY GRITTY: Some grit is felt but nongritty material (silt and clay) is dominant (20-50% sand).

GRITTY: Sand is felt as the dominant material. Some nongritty material can be felt between sand grains (50-80% sand).

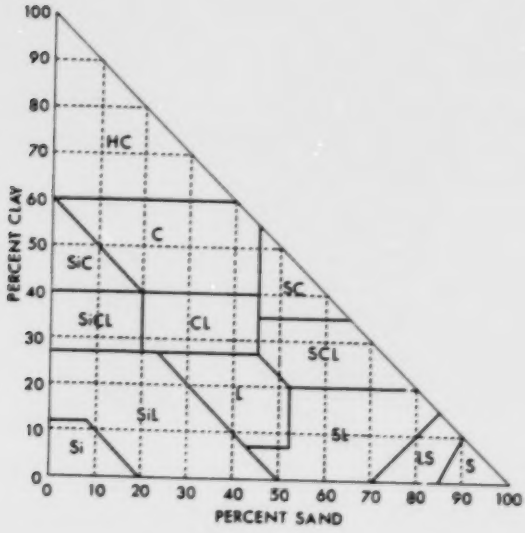
VERY GRITTY: Sand is the only material that is felt. Little or no nongritty material present (greater than 80% sand).

Step 5

After stickiness and grittiness have been determined, the hand texturing table can be used as an approximate guide to the textural class of the soil. The textural triangle (Figure 14) can be used for a more accurate determination of the textural class.

	NON GRITTY (<20% sand)[a]	SLIGHTLY GRITTY (20-50% sand)	GRITTY (50-80% sand)	VERY GRITTY (>80% sand)
VERY STICKY (>40% clay)[a]	SILTY CLAY	CLAY	SANDY CLAY	--
STICKY (25-40% clay)	SILTY CLAY LOAM	CLAY LOAM	SANDY CLAY LOAM	--
SLIGHTLY STICKY (10-25% clay)	SILT LOAM or SILT	LOAM[b]	SANDY LOAM	--
NON STICKY (<10% clay)	--	--	--	LOAMY SAND or SAND

[a] Sand and clay limits are approximate.
[b] A loam is a textural class exhibiting physical properties intermediate between those of sand, silt, and clay.



Soil textural triangle.

APPENDIX 3. Identification of upland humus forms

Mors:	- matted F horizon[a] - common fungal mycelium (white or yellow) - little or no intermixing of organic and mineral materials - abrupt boundary between organic and mineral horizons
Moders:	- loosely arranged F horizon[a] - friable - insect droppings - fungal mycelium and soil organisms (arthropods and occasional earthworms) - intermixing of organic and mineral horizons - gradual transition between mineral and organic horizons
Mulls:	- often no F[a] or H horizons (thin if present) - insect droppings abundant - usually many soil organisms but may form from decomposition of a dense network of roots (usually abundant earthworms) - considerable intermixing of mineral and organic layers, with incorporation of organic matter into surface mineral soil (Ah horizon)

[a]F horizon: horizon in which partial (rather than entire), macroscopically recognizable vegetative structures are dominant (i.e., the horizon is partially decomposed).

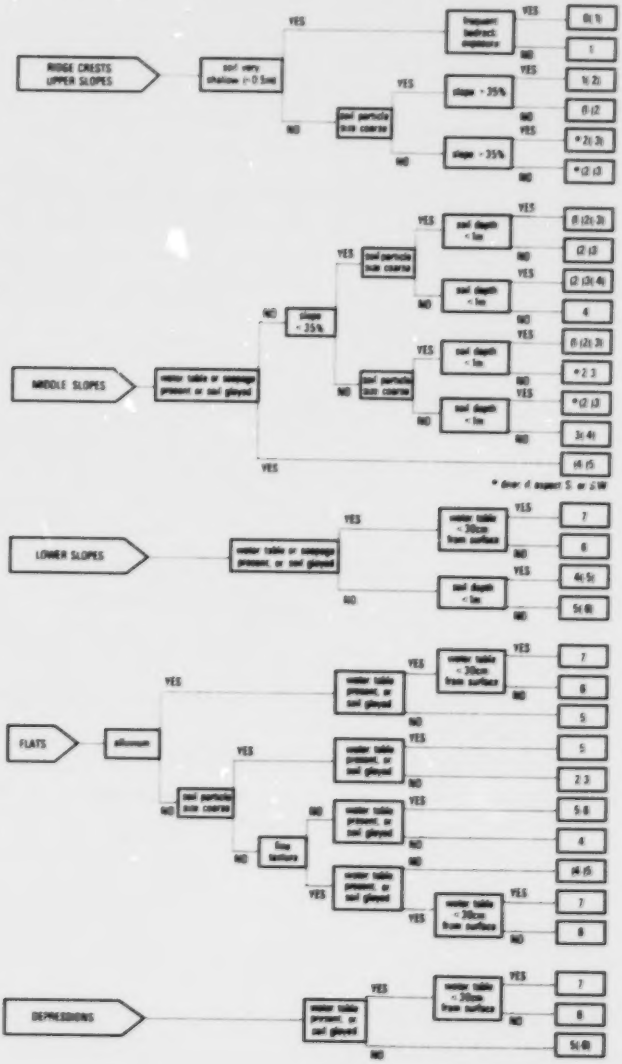
APPENDIX 4. Key to the identification of potential moisture regime (part 1) (from Green et al. 1984)

This key was devised to aid field staff in identifying potential moisture regimes using readily observable environmental features. It should be applied with caution on ridge crests, upper slopes, and middle slopes which have soils with thick (>20 cm) organic layers. Moisture regime in these cases will generally be higher than indicated. The table below provides definitions for the categories used in the key.

Category	Definition
Ridge crest	height of land, usually convex slope shape
Upper slope*	the generally convex shaped, upper portion of a slope
Middle slope	the portion of a slope between the upper and lower slopes, the slope shape is usually straight
Lower slope	the area towards the base of a slope, the slope shape is usually concave. It includes toe slopes which are generally level areas located directly below and adjacent to the lower slope
Flat	any level area (excluding toe slopes), the surface shape is generally horizontal with no significant aspect.
Alluvium	post-glacial, active floodplain deposits along rivers and streams in valley bottoms, usually a series of low benches and channels.
Depression	any area that is concave in all directions, usually at the foot of a slope or in flat topography
Soil depth	depth from the mineral soil surface to a restricting layer such as bedrock, strongly compacted, or strongly cemented materials (e.g. "hardpan").
Gleyed	soils that have orange coloured mottles indicative of a fluctuating water table. Permanently gleyed soils are dull yellowish, blue, or olive in colour.
Soil particle size coarse	sandy* with > 35% volume of coarse fragments, or loamy* with > 70% volume of coarse fragments
Fine texture	silty* or clayey* with a low coarse fragment volume

* Sandy - LS, S; loamy - SL, L, SCL; clayey - SCL, CL, SC, SiC, C; silty - Si, Si, S.

APPENDIX 4. Key to the identification of potential moisture regime (part 2)



APPENDIX 5. Key to the identification of soil nutrient regime[a]

1a Coarse-textured

2a Very high coarse fragments (>50%) or very shallow (<30 cm) soil.

3a Mor humus form

Very Poor

3b Moder humus form

Poor - Medium

2b Low or zero coarse fragments, deep soil

4a Mor humus form

Poor

4b Moder humus form

Medium

4c Mull humus form

Rich - Very Rich

1b Moderately coarse- and medium-textured

5a Very high coarse fragments (>50%); or very shallow soil (<30 cm); or shallow rooting depth

6a Mor humus form

Poor

6b Moder

Medium

5b Low or zero coarse fragments without restricted rooting depth

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[a] The presence of base-rich parent materials (limestone, shales, basalt) may improve the nutrient status.

7a Mor humus form

Poor - Medium

7b Moder humus form

Medium - rich

7c Mull humus form

Very rich

1c Moderately fine- and fine-textured

8a Very high coarse fragments (rare); or very shallow soil; or shallow rooting depth (<15 cm)

9a Mor humus form

Poor - Very Poor

9b Moder humus form

Medium - Poor

9c Mull humus form

Rich

8b Low or zero coarse fragments, with good rooting depth (>20 cm)

10a Mor humus form

Medium

10b Moder humus form

Rich

10c Mull humus form

Very Rich